Bulletin of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research.

v. 2
Ja-Dec
1923

Volume 2, 1923

Edited by the Secretary of the Society, Ross C. Purdy
Assistant Editor, Emily C. Van Schoick
Assisted by Officers of the Industrial Divisions

F. H. Rhead, H. S. Kirk — Art

A. R. Payne, A. E. Williams — Glass

H. F. Staley, R. R. Danielson — Enamel

E. E. Ayars, R. F. Ferguson — Refractories

F. H. Riddle, C. C. Treischel — White Ware

A. F. Hottinger, R. L. Clare — Terra Cotta

R. B. Keplinger, A. P. Potts — Heavy Clay Products

BULLETIN
of the
American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Vol. 2 February, 1923 Nos. 1 and 2

EDITORIAL

WHAT SERVICE SHOULD BE RENDERED BY THE AMERICAN CERAMIC SOCIETY IN 1923

When the American Ceramic Society engaged a secretary for full-time service it was done that the Society could more effectively serve the Ceramic Industries. Only a limited number of the proposed lines of activities could be followed through as fully as had been planned, but with the larger experience and with the more efficient organization a larger service in 1923 is not only possible, but is essential.

The three new Divisions: Art, Heavy Clay Products and Whitewares, are now well under way with definite purposes and well-working organizations.

The *Journal* has been enlarged, the world's literature abstracted more thoroughly and more discussions of papers and topics developed, and the *Bulletin* instituted. Some of our friends have been so kind as to tell us that the *Journal* is a live, inspiring report of research activities.

The Divisions, the Local Sections, the Committees, the Board of Trustees and the *Journal*, it seems to us, should be the means to the ends for which the Society was organized and chartered: To promote the ceramic arts and sciences.

How can the ceramic arts and sciences be most effectively promoted? This is the query in answer to which we shall direct our efforts during this year.

Mr. A. V. Bleininger outlined a program of activities in September, 1921, which seems to us to be well worth adopting for 1923. If those to whom his recommendation makes an appeal will collaborate with the executives and committees there is no reason why a considerable portion, if not all of this program, can not be realized.

1. The work of certain committees should be pushed very vigorously immediately. I am referring particularly to the Committee on Standards. No more important work could be undertaken than the standardization, through specifications, of the principal raw materials, such as flint, feldspar, ball clays, sagger clays, etc. Certain misconceptions as to the functions of these materials cause a continuous loss which could be readily stopped. A modern classification of clays, based entirely upon their physical properties, is urgently needed.

2. Steps should be taken also to compile the information already available for use. A large amount of data is scattered through our *Transactions* and various *Journals* which should be brought together in the form of a handbook, like the "Sprechsaal Kalender," but much larger, more complete and better all around. The book might be divided into two parts, one dealing with general information and the other with specific industries. The former could be prepared by assigning different subjects to men well qualified to handle them. The industrial topics could be turned over to the Divisions who would be best qualified to include the material most valuable and to arrange it in the best manner.

3. Research organization is desirable. The only point is that we must not overdo this kind of work. The industries have never yet failed to produce any kind of a product, which may be needed in any quantity, quite different from some of the purely chemical industries and the need for research is not as acute as it is with them.

4. The great need of the industries is for trade schools, in which the young clay workers of the country may be trained for their work and for advancement. As it is, the thousands of young men engaged in factory work have no opportunities, and the places to which they aspire are taken by college trained men having no previous connection with the industries. The need is imperative for schools like those at Stoke-on-Trent, Sèvres, Bunzlau, Hoehr, Teplitz, etc., where through afternoon and evening classes the young men are given an opportunity to really learn the fundamentals of their trade, which is not done in the present status of the apprentice system, and in addition be given the technical principles of the manufacturing processes. This could be worked out in several of the leading ceramic centers in connection with the High Schools, supplemented by workshops and laboratories made available through coöperation on the part of the manufacturers. There is no reason whatever why one or two such schools, in addition to the one at Trenton, could not be established, and the SOCIETY could do no better work than to lend its influence towards this end. The trade schools of Germany have played an important part in the industrial development of that country

and we also can no longer neglect our industrial population. It must be given opportunities not only from the standpoint of industrial training, but also from that of citizenship and higher aspirations. We must do our part to help raise our people from the deadly mediocre level to a higher one.

5. The preceding paragraph is not intended in any way to prejudice the cause of collegiate education in this field. But with the development of trade schools, the level of accomplishment on the part of the college trained man must undoubtedly be raised. The need along these lines is not number of graduates but quality of training, and even now it would seem that the four years' course is hardly adequate, and it might become necessary to insist upon a five years' course or one of four years with summer studies. The danger of overcrowding the field with a large number of indifferently trained graduates is very real, and we should not encourage the example set by the colleges as regards technical training in general. The country has been flooded with poorly trained men for whom there are not sufficient places in normal times. We are not desirous to create a technical proletariat.

I believe it would be well if the SOCIETY gave some attention to ceramic education and could counsel the schools in connection with the general problem and such details as might come up for consideration.

PAPERS AND DISCUSSIONS

DISCUSSION ON "THE RELATIVE MERIT OF HEAT RESISTING ALLOYS FOR ENAMEL BURNING RACK"[1]

By I. F. Cox:—The data presented by Mr. Poste are of particular interest, not only from the standpoint of the user of enameled products, but of all furnace users, as metals play an important part in the construction of most furnaces.

The composition of the furnace atmosphere, the fuel used in firing, and other furnace conditions will have a considerable effect on the degree of oxidation of metal parts. This is of course a function also of temperature, and this temperature would have to be known quite accurately to obtain any strictly comparable results. For instance, in the matter of calorized steel, we recommend it only for intermittent service above 1700°F, for continous service at or below that temperature. Experience in a variety of applications has indicated that the dead line is perhaps sharper than one would think.

In connection with the place occupied by calorized steel in this list, it would be of interest to know the kind of steel to which the calorizing had been applied, and whether this was effected by the dipping or powder process. Judging from the data in Table I, it is probably a piece of rolled steel, as a piece of calorized steel will have a slightly higher resistance to warpage (as measured by this test) than the same piece of steel uncalorized. A piece of cast steel, calorized, would occupy a higher position in Table I, and the same position it now occupies in Table II.

The accurate determination of the relative resisting power of various metals is very difficult to determine from laboratory data, principally because it is quite difficult to exactly reproduce the commercial conditions under which these metals are to be used. The "order of magnitude" can so be determined, and thus an indication given of what metals are worth trying out on a commercial scale. Where possible, it is highly desirable to subject several sets of the test pieces to commercial conditions. On the basis of results obtained from such a test, or from laboratory tests, the next logical step is the trial of one or two commercial sized pieces under operating conditions, of these alloys which look most promising. It is interesting to note that two alloys mentioned in Mr. Manson's discussion of Mr. Poste's paper, occupy a different relative position at 2000°F, than they do in Mr. Poste's experiments at 1700°F. This indicates further, the desirability of subjecting the test to actual commercial conditions, wherever possible.

Mr. Poste has well pointed out the necessity of considering the various conditions to be met—the relative importance of warpage, oxidation, etc., and the consideration of the whole matter on the basis of relative

[1] *Jour. Amer. Ceram. Soc.*, **5** [11], 811 (1922).

cost. In figuring costs on this basis, there must often be taken into consideration the matter of cost of replacing and lost production during the time required for replacement.

CALORIZING CO.
PITTSBURGH, PA.

NOTE ON "THE DISINTEGRATION OF SODA LIME GLASS IN WATER"

BY J. C. WITT:—In a paper on the above subject by Arthur E. Williams[1] it is stated that when soda lime glass has been treated in water at temperatures below boiling, at boiling point, and up to 25 pounds pressure in an autoclave, disintegration results—*i. e.*, cracks, spalls and loss in weight. This is a very interesting paper and reminds me of some failure of glass fruit jars in this laboratory.

We have not been carrying on any research on glass, but in connection with some of our work we have filled glass fruit jars with water or solutions, covered the top with a rubber membrane and then placed them in water in a larger cylinder where they were subjected to a hydrostatic pressure of 500 pounds per square inch for periods ranging from several days to several months.

None of these jars broke in service, nor did they break immediately after removing from the pressure cylinder. However, it has been observed that a number of these jars have cracked several weeks after the pressure treatment. In the first instances it was taken for granted that the jars had been cracked as a result of moving them around the laboratory but so many cases have been observed that it is now known that this is not the case.

In the light of the paper by Mr. Williams, it seems that the glass may have been attacked to some extent by the water under pressure, although they were not subjected to anything above room temperature. A possible explanation is that they were weakened by this treatment, then at some later time became cracked due to slight changes of temperature in the laboratory.

REPLY BY A. E. WILLIAMS:—The occurrence noted by Mr. Witt regarding the spontaneous breakage of glass articles has come to my attention a number of times. This has especially been noted with large vessels used for show purposes or for the storage of organic specimens, which have given way spontaneously after a year or more of standing filled with liquids, usually alcohol or salt solution. The more resistant soda-lime glass now generally made would probably never exhibit any such breakage, the cause of which may possibly be explained as a release of stresses in the surface film, due to solution lowering the tensile strength of the article as a whole.

[1] *Jour. Amer. Ceram. Soc.*, **5** [8], 504–17 (1922).

PRESIDENT'S PAGE

DR. ORTON TO INDUCT 1923 OFFICERS INTO OFFICE

All of the older members of the SOCIETY who have attended any of the earlier conventions will remember how Dr. Orton introduced the new officers to the members. Everybody felt that it was a privilege to be there and the officers themselves felt that the honors they were receiving were even greater than they had previously considered them to be. After the officers had been installed, the group of two or three who had been selected to be promoted to active membership were formally presented to the SOCIETY and made to feel that the promotion was not only an honor but that they deserved this recognition as a compensation for the loyalty they had shown the SOCIETY as well as for their contributions.

It is a pleasure to announce that Dr. Orton has written accepting our invitation to induct the 1923 officers into office at the banquet at the annual meeting in Pittsburgh.

We deem it an honor to have him with us at our Silver Jubilee Meeting and are sure that his presence will be of interest and so appreciated by the older members that they will arrange to attend the meeting.

REPRESENTATION OF DIVISIONS ON THE BOARD

The November *Bulletin* announced a proposed amendment to the Constitution[1] which was introduced at the meeting held at the Chemical Exposition by Messrs. Staley, Sweely and eight other members. This amendment was later withdrawn with the understanding that it would again be brought up by the Rules Committee after some alterations had been made in the methods of election and terms of office of the various members.

The important point about the amendment is that it provides that the Board of Trustees will include as a member a trustee from each Division, each trustee to be chosen by the particular division which he represents. This is a step towards decentralized control and should receive the hearty support of all. The present method of having three trustees besides the officers and two past presidents, and having these men chosen at random regardless of division connections, has worked well in the past but is not adequate for our present needs.

The three most important points to consider in the procedure for the accomplishment of this are the method of election by the division members, the term of office, and the schedule for the year of installation of trustees from each Division, so that the entire board will not go out of office at once. This provision for an overlapping of terms of office of the various trustees is the most important point to consider. It is hoped that the Rules Committee will be in position to present the proposed amendments at the February meeting and that they will receive everybody's hearty support.

[1] *Bull. Am. Ceram. Soc.*, **1** [11], 321(1922).

ACTIVITIES OF THE SOCIETY

OH, SHOOT!

Whether the season's sport is rabbit hunting or African golf, the record of the past two months is not to be sneezed at by those who have been taking a rest since the football team disbanded. Evidently a law has been passed prohibiting the bagging of more than one Corporation Member by an individual, and in eight weeks we have only five to show, but the smaller game has been plentiful and fifty-two specimens are ranged in the Secretary's office. W. E. Lemley has proved himself an all-round sportsman and heads the list. Ira Sproat reached up a little way into the sky and pulled down a big bird with one hand and a little one with the other. W. E. Dornbach and M. Ichiyo each came in with two, and thirty-six hunters have one apiece. C. L. Sebring, Geo. S. Tillotson, and A. Weber, Jr., are responsible for the big game. The score card follows:

	Personal	Corporation		Personal	Corporation
W. E. Lemley	4		F. A. Kirkpatrick	1	
Ira E. Sproat	1	1	J. H. Krusen	1	
W. E. Dornbach	2		R. D. Landrum	1	
M. Ichiyo	2		A. Malinovszky	1	
C. L. Sebring		1	C. R. Minton	1	
Geo. S. Tillotson		1	F. K. Pence	1	
A. Weber, Jr.		1	F. H. Rhead	1	
L. R. W. Allison	1		Will A. Rhodes	1	
F. H. Auld	1		R. F. Segsworth	1	
C. E. Bales	1		Mary G. Sheerer	1	
L. E. Barringer	1		C. Saxton	1	
G. H. Brown	1		A. Silverman	1	
Lawrence H. Brown	1		Harry F. Spier	1	
B. M. Burchfiel	1		W. E. S. Turner	1	
R. R. Danielson	1		K. E. Ward	1	
M. S. Gifford	1		R. V. Widemann	1	
R. B. Gilmore	1		W. J. Watkins	1	
Herbert Goodwin	1		W. W. Wilkins	1	
Chas. O. Grafton	1		W. S. Williams	1	
R. K. Hursh	1		Hewitt Wilson	1	
S. M. Kier	1		Office	8	1
R. M. King	1				
			Total	52	5

The net increase for 1922 is:

	Personal	Corporation
Jan. 12, 1923	1611	216
Jan. 1, 1922	1350	139
	261	77

The gross increase by periods since December 1921 is as follows:

	Personal	Corporation	Total
December to February, 1922	68	5	73
February to May	81	10	91
May	13	13	26

	Personal	Corporation	Total
June	13	5	18
July	25	11	36
August	20	5	25
September	31	11	42
October	31	12	43
November	25	7	32
December to January 12, 1923	52	5	57
Total	359	84	443
Loss	98	7	105
Total	261	77	338

NEW MEMBERS RECEIVED FROM NOVEMBER 16, 1922, TO JANUARY 12, 1923

Associate

Anderson, Edward, 206 Grosvenor Ave., Dayton, O., Superintendent, The A. A. Simonds-Dayton Co., Dayton, O.

Barkby, Harry, Decorating Manager, Chelsea China Co., New Cumberland, W. Va.

Botfield, Leonard B., 776 S. Swanson St., Philadelphia, Pa., Botfield Refractories Co.

Byrnes, A. Marietta, 63 Audubon Place, New Orleans, La.

Compton, Max D., 232 W. 42nd Place, Los Angeles, Calif., Ceramic Engineer, Los Angeles Pressed Brick Co.

Conaway, W. P., Production Manager and General Superintendent, Western Pottery Co., Denver, Colo.

Conover, Norman, Denny-Renton Clay & Coal Co., Taylor, Wash.

Corson, Kenneth P., 115 County-City Bldg., Seattle, Wash.

De Celle, Joseph A., 625 N. Genesee, Waukegan, Ill.

Didisheim, Frank Marcel, 234 Union St., Schenectady, N. Y. General Electric Co., Schenectady, N. Y.

Early, Joseph N., 240–246 Huron St., Brooklyn, N. Y.

Fessler, A. H., Asst. Cer. Engr., U. S. Bureau of Mines, Columbus, O.

Gerber, Albert C., Cer. Engr., John L. Mott Co., Trenton, N. J.

Goodwin, James Rushworth, 1267 Kenilworth Ave., Coshocton, O., Assistant to Factory Manager.

Graham, Charles E., 156 Hope St., Huntington Park, Calif., Asst. Chemist, Washington Iron Works.

Harrison, Wm. Nance, 4319 Iowa Ave., N. W., Washington, D. C., Laboratory Assistant, Bureau of Standards.

Hathaway, G. Frank, Genl. Supt., Wyman-Gordon Co., Worcester, Mass.

Homer, Marion, 368 Ashland Ave., Riverforest, Ill., Instructor of Art, McKinley High School.

Hull, Addis E., Jr., 1252 Euclid Ave., Zanesville, O., Assistant to Gen. Mgr., A. E. Hull Pottery Co., Crooksville, O.

Ikeda, Sertio, Nippon-Beer-Kosen-Kaisha, Amagasaki near Osaka, Japan.

Kamikawa, Michiro, Nippon-Beer-Kosen-Kaisha, Amagasaki near Osaka, Japan.

Kingsley, Charles B., Elizabeth, Pa., Asst. Mgr., Mississippi Glass Co., Floreffe, Pa.

Kreutzer, Walter E., 4640 Cliff Ave., Louisville, Ky., Foreman, Louisville Fire Brick Works.

Leahy, Arthur T., 5490 Ellis Ave., Chicago, Ill., Mgr., Plastic Dept., A. P. Green Fire Brick Co.

Lemmax, Wm. W., Box 59, Taylor, Wash., Chief Engineer, Denny-Renton Clay & Coal Co.,

Ligon, W. A., Box 246, Mayfield, Ky.

McConnell, Oscar F., Box 65, Taylor, Wash.

McVay, Thos. N., Instructor Ceramic Dept., University of Illinois, Urbana, Ill.

Middleton, G. Gregg, 7 Highland Grove, Worksop Notts, England, Works Manager, Selands Glass Works.

Miller, Robert V., Y. M. C. A., E. Liverpool, O., Ceramic Engineer, Knowles, Taylor & Knowles Co.

Mize, W. E., 514 Bangor Bldg., Cleveland, O., Ohio representative, Golding-Keene Feldspar Co.

Norton, Charles L., Professor of Physics, Mass. Inst. of Technology, Cambridge, Mass.

O'Brien, Thomas H., 27 Mathewson St., Providence, R. I.

Plank, Ross D., 532 La Salle Ave., Culver City, Calif., Glaze Chemist, Los Angeles Pressed Brick Co.

Poste, James, Denny-Renton Clay and Coal Co., Taylor, Wash.

Prentice, Ernest B., Box 513, Massillon, O., Vice Pres. and Secy., Massillon Refractories Co.

Pressler, E. E., 1835 Indianola Ave., Columbus, O., Laboratory Assistant, U. S. Bureau of Mines.

Riviere, Georges, 98, Boulevard de Courcelles, Paris, Ingenieur des Arts et Manufactures, Administrateur-Directeur de la Cie Gle de Construction de Fours.

Scalise, Antonio, Columbia Glass Co., Fairmont, W. Va.

Sloan, Burrow, 117 South 16th St., Philadelphia, Pa., Vice Pres., General Refractories Co.

Smart, Richard Addison, 114 Colorado Ave., Detroit, Mich., Detroit representative, American Refractories Co.

Smith, Ralph Ogden, 19 Chestnut St., Salem, N. J., Chemist, Salem Glass Works.

Tapper, E. H., 58 Holcomb St., Charlotte Station, Rochester, N. Y.

Taylor, Albert C., Woodworth Hotel, Robinson, Ill., Asst. Engr., W. A. Dase & Son Mfg. Co., Buffalo, N. Y.

Vernon, Cecil, 182 Shaftesbury Ave., Thorpe Bay, Essex, England, Engineer, Newalls Insulation Co.

Webb, R. S., Chemist, American Window Glass Co., Belle Vernon, Pa.

Weeden, Charles H., 1295 N. 4th St., Columbus, O.

Wehtje, Ernst, Bromölla, Sweden, Managing Director, Aktiebolaget Ifö Chamotte & Kaolinverk.

Wescott, Ernest Waters, c/o Niagara Alkali Co., Niagara Falls, N. Y., Research Engr., Kalmus, Comstock & Wescott.

Whitesell, Buhel E., Salina, Pa., Cer. Engr., Kier Fire Brick Co., Pittsburgh, Pa.

Wilson, Louis A., Chf. of Testing Dept., New Jersey Zinc Co., Palmerton, Pa.

Wormer, Grace, University Library, Iowa City, Iowa, Acting Librarian.

CORPORATION

All-in-One Plumbing Fixture Corp., 231 Ochsner Bldg., Sacramento, Calif.

Crescent China Co., Alliance, Ohio.

Sterling Grinding Wheel Co., Tiffin, O.

Vanderbilt, R. T. Co., 50 East 42nd St., New York City.

Weber Electric Co., Schenectady, N. Y.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY?

Frederick M. Becket of the Union Carbide Company, Niagara Falls, N. Y., is now located at 30 E. 42nd Street, New York, N. Y.

Edward R. Beidler, formerly of Toronto, Ont., Can., has moved to 356 E. National Ave., Brazil, Ind.

William J. Benner has notified the office of a change of address in Chicago from 6338 Wayne Ave., to 1409 Rosemont, Edgewater Station.

Leonard S. Briggs, of Lenox Inc., can be reached by addressing mail to Box 694, Trenton, N. J.

Wilson C. Broga formerly of Worcester, Mass., is now living in Greenfield, Mass.

Orello S. Buckner has moved from Holden, Mass., to 13 Charles St., Westboro, Mass.

John Lister Carruthers has severed his connection with The Denver Terra Cotta Co., and is now located at 66 S. 3rd St., Columbus, O.

Champion Ignition Company, Flint, Mich., is to be addressed in future as the A C Spark Plug Company.

Charles R. Fettke has changed his address from Carnegie Institute of Technology to 1118 Wightman St., Pittsburgh, Pa.

J. Parker B. Fiske has notified our office that his new address is 839 Beacon St., Boston, Mass.

Charles E. Golding of Golding Sons Co., has moved from 3rd & Hanover St., to 31 Columbia Ave., Trenton N. J.

Herbert Goodwin of the Crescent China Co., has been transferred from Niles, O., to Alliance O.

John S. Grainer has severed his connection with the Challenge Refrigerator Co., Grand Haven, Mich., to accept a position with the Estate Stove Co., his present address being 706 W. Main St., Hamilton, Ohio.

Maurice B. Greenough, formerly of Cleveland, O., is now located at 801 Volunteer Bldg., Chattanooga, Tenn.

Fred T. Heath of The Heath Unit Tile Co., informs this office that the firm is now located in the Puget Sound Bank Bldg., Tacoma, Wash.

J. W. Hepplewhite is now with the Johns Manville, Inc., Manville, N. J.

Interstate Corporation has been changed to The Bowman Coal Co., Broad Street Bank Bldg., Trenton, N. J.

Walter A. King of the Elyria Enameled Products Co., has changed his residence to 149 Branston, Elyria, O.

F. A. Kirkpatrick of Unionville, Mich., advises us that his new address is 1001 W. Pine St., Robinson, Ill.

George J. Lawrence, formerly of Chicago is now with the J. B. Ford Co., Wyandotte Michigan.

P. William Lee writes that he is now with the Denver Terra Cotta Company at Denver, Colo.

Wm. R. Malkin informs us that he has taken a position with the B. F. Drakenfeld Co., Inc. at East Liverpool, O.

Frederic Merian has removed from 3415 Iowa street, Pittsburgh, to 815 St. James Street.

L. M. Merrit is now living at 481 Lexington Ave., Columbus, O.

Julius A. Miller who has been conducting work at Mellon Institute for H. Kopper Co., informs us that he has taken a position with Nesbit and Bollen, 403 Liberty Ave Pittsburgh, Pa.

G. Z. Minton, of Kokomo, Ind., is now living at Elwood, Ind.

W. O. Mitcherling has asked that his address be changed from Landing, N. J., to Wilmington, Del.

Amos Potts recently of the Clay Products Co., Brazil, Ind., is now living at 47 N. 20th St., Columbus, O.

Prof. L. M. Richard is now living in Ocean Park, Cal., 2614 4th Street.

Edward J. Risch has notified us to change his address to 1534 Massosvoit Ave., Chicago, Illinois.

V. J. Roehm who has been with the Homer Laughlin China Company of Newell, W. Va., is now with Sec. 1, Division 9, Bureau of Standards, Washington, D. C.

E. M. Rupp, formerly of Keyport, N. J., is now in Middletown, O., 714 Lincoln Ave.

Harry W. Smith who has been living in Cleveland, O., writes that his address is 307 Fulton Bldg., Pittsburgh, Pa.

Peter Wachovec has notified us that he has moved to 9620 Park Heights Ave., Cleveland, O.

R. H. White has left Norton Company at Niagara Falls, N. Y. and is situated with the Abrasive Company of Canada, Ltd., Burlington St., Hamilton, Ont.

Richard P. White has returned from Hamilton, Ont. and is living at 121 S. Menard Ave., Chicago, Ill.

Y. Y. Wong has returned to Canton, China from Los Angeles, and is working with the Chen Kwong Co., Sap Pat Po.

REPORT OF CHICAGO LOCAL SECTION MEETING

On Dec. 2, 1922, the Chicago Section American Ceramic Society held at the Morrison Hotel, Chicago, the annual meeting which broke all standing records for attendance and interest. Sixty-five gathered around the banquet boards, which is more than double the second best number. We are not sure but that this sets a new record for any Sectional meeting not held in conjunction with any other organization. At any rate, the Executive Committee feels justly proud of the result of their efforts. Possibly the fact that a beautiful wired vase was given away (product of W. W. Wilkins, Lewis Institute) helped swell the crowd, as this was a "wonderful opportunity for somebody" to get a nice Christmas present for friend wife without paying for it. Mr. C. A. Underwood of the American Refractories Company, Joliet, was the lucky man. We heard someone near us remark that giving a lamp without a shade was like giving a set of books and paying the first installment, but we trust Mr. Underwood does not look at it in that light.

The program was sufficiently rich in material to be of interest to everyone present no matter with what branch of the industry he may have been allied. B. T. Sweely, of the Cribben-Sexton Stove Works, talked on "Defective Enamels," which, to the many enamel men present, held much food for thought. Mr. Sweely is very well qualified to talk on this subject for two reasons: the first being that he spent several months on special investigation work at the Bureau of Standards, Washington, and second, to use his own words, because he has made more defective enamels than any one else in the country.

We were very much pleased to have on our list of speakers Mr. E. O. Herman of the A. D. Little Co., Ind. Engineers, Boston, Mass., whose talk on the "Technical Man's Position in Production" held everyone's interest for more than half an hour. No one can listen to Mr. Herman without feeling some of his tremendous enthusiasm.

"Something Better in Enamel Smelters" by H. E. Davis, Northwestern Terra Cotta Company was a description of a furnace designed and built along principles adapted

for the most part from the Steel Industry in order to give the greatest possible efficiency to this process. The combustion chamber for the oil flame, the arch over the bath, and the insulation are the salient features of the furnace

Of greatest importance to the Chicago Section and the Ceramic Industries of this part of the country is the "Proposed Introduction of a Course in Ceramics in The New Crane Junior College of Chicago." Mr. Meyer, Assistant Principal of the school left his sick-bed to talk to us on this proposition, for the success of which he is putting forth every effort, and asking for our whole-hearted support. A committee has been appointed to coöperate with Mr. Meyer and he may rest assured that we are "with him" on anything so fine and worthy.

After the reading and discussion of the papers, the Annual Election of Officers was held, and the following were elected:

B. T. Sweeley	Pres.
W. W. Wilkins	Vice-Pres.
H. E. Davis	Sec'y. & Treas.
D. F. Albery	Ch'm. Prog. Comm.
Alan S. Wikoff	Ch'm. Memb. Comm.

Having seen what can be done to make a real live Local Section, the new officers are determined to uphold the reputation.

Respectfully submitted,

H. E. Davis, *Secretary*

MEETING OF THE PITTSBURGH DISTRICT SECTION OF THE AMERICAN CERAMIC SOCIETY

A meeting of the Pittsburgh District Section of the American Ceramic Society was held in the Fellow's Room of the Mellon Institute, Pittsburgh, Pa., on December 2, 1922, at 3: 00 P.M. with Mr. A. F. Greaves-Walker, the retiring chairman, and Dr. Alexander Silverman, the newly elected chairman, presiding.

The committee on nominations, submitted their report and on motion duly seconded the following officers were elected for the coming year:

Chairman	Alexander Silverman
Vice-Chairman	Francis C. Flint
Secretary	H. G. Schurecht
Treasurer	Thos. H. Sant
Councillor	Francis W. Walker, Sr.

The following reports of the committees were made:

Publicity

Dr. Tillotson reported for this Committee, that four or five feature stories regarding the meeting and abstracts of some of the papers will be printed in the newspaper.

Mr. Greaves-Walker, Jr., suggested that one man act as a publicity man to take the events of each day and present them to the newspaper. *The Clay Worker* also expressed their willingness to publish notices regarding the convention.

Mr. Greaves-Walker, Sr., suggested that all publicity reports be put in writing for publication.

Dr. Silverman suggested putting announcements in some of the moving picture theatres.

Service Committee

H. G. Schurecht reported that plans were being made whereby each division will know what papers are being presented in the other divisions.

SMOKERETTE COMMITTEE

It was decided to hold the smokerette on Tuesday night instead of Wednesday which date will be used for the Alumni party.

BANQUET COMMITTEE

Dr. Silverman stated that this would start promptly at 7:00 P.M. Speakers will be provided, honor guests will be heard from and souvenirs will be presented. A registration fee of $7.50 will be charged which will take care of the banquet smoker and entertainment of the ladies. Those members living in Pittsburgh will pay $10.00

ENTERTAINMENT OF LADIES

Mr. Greaves-Walker reported that the ladies will hold a reception and tea in room adjoining the general assembly room of the William Penn at 4 to 5 P.M., Monday. They will have a luncheon Tuesday noon at Heinzes. On Wednesday, a luncheon and Theatre Party will be held.

Ross suggested that a playette be given by the students in drama of Carnegie Tech.

TRIPS COMMITTEE

Mr. McDowell reported that four trips will be taken on Thurdsay and three on Friday. On Thursday one group will go to Beaver Falls escorted by F. W. Walker. A city trip to The Standard Sanitary Manufacturing Company, Pittsburgh Clay Pot Company and The Heinz Bottle Factory will be made. The third trip on Thursday will be to the glass plant at Creighton, Pa. The fourth will be to The By-Products Coke Works, Clairton, Pa.

On Friday one trip will be made through the Carnegie Steel Company, Homestead.

Another trip will be taken to the By-Products Coke Oven Plant, Hazleton, The Westinghouse Electric Company, and the National Tube Company.

A third trip on Friday will be taken to Washington, Pa., as trip to East Liverpool was cancelled because of the potter's strike.

Respectfully submitted,

H. G. SCHURECHT, *Secretary*

NOTES AND NEWS

CALENDAR OF CONVENTIONS

American Association of Flint and Lime Glass Mfrs.—April, 1923.
American Association of Ice & Refrigeration—Washington, D. C., Probably March, 1923.
AMERICAN CERAMIC SOCIETY—Pittsburgh, Pa., February 12–16, 1923.
American Dental Trade Association—Spring Lake, N. J., June, 1923.
American Face Brick Association—First Week in December, 1923.
American Face Brick Association, Southern Group—West Baden, Ind., November, 1923.
American Foundrymen's Association—Cleveland, Ohio, April 30–May 3, 1923.
American Gas Association—October, 1923.
American Hotel Association of United States and Canada—San Francisco, April, 1923.
American Institute of Mining and Metallurgical Engineers—New York City, February, 19–22, 1923.
American Society for Testing Materials—Place not determined, June, 1923.
American Zinc Institute—St. Louis, Mo., May 7 and 8, 1923.

Association of Scientific Apparatus Makers of the United States of America—Washington, D. C., April 20, 1923.

Chamber of Commerce of the United States of America—New York City, May 8–10, 1923.

Clay Products Association—Chicago, Ill., Third Tuesday in each month.

Common Brick Manufacturers' Association—Cleveland, Ohio, February 5, 6 and 7, 1923.

Dental Manufacturers' Club of the United States—Spring Lake, N. J., June, 1923.

Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18, 1923.

International Chamber of Commerce—Rome, Italy, Week of March 19, 1923.

Manufacturing Chemists' Association—New York, June, 1923.

National Association of Brass Manufacturers, March, 1923.

National Association of Manufacturers of Pressed and Blown Glassware, Pittsburgh, March 13, 1923.

National Association of Manufacturers of the United States—New York City, Week of May 14, 1923.

National Association of Stove Manufacturers—Richmond, Va., May 9, 1923.

National Association of Window Glasss Manufacturers—Place and date not determined.

National Association Builders Board of Control—Des Moines, Ia., February, 1923.

National Board of Fire Underwriters—New York, May 24, 1923.

National Bottle Manufacturers' Association—Atlantic City, N. J., Last of April, 1923.

National Brick Manufacturers' Association—Cleveland, Ohio, February 5–10, 1923.

National Clay Machinery Association—Cleveland, Ohio, February 7 and 8, 1923.

National Gas Appliance Manufacturers' Exchange—Kansas City, Mo., May, 1923.

National Gas Association of America—Louisville, Ky., Spring, 1923.

National Paving Brick Manufacturers' Association, December, 1923.

National Gas Association of America—Louisville, Ky., April 23–24, 1923.

Refractories Manufacturers' Association—March 21, 1923.

Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.

Southern Association of Stove Manufacturers—Louisville, Ky., March, 1923 (?).

Stoker Manufacturers' Association—May or June, 1923.

Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BUYERS' GUIDE

Air Compressors
General Electric Co.

Alumina (Hydrate and Calcined)
Pennsylvania Salt Mfg. Co.

Auger Machines
Chambers Brothers Co.

Automatic Cutters
Chambers Brothers Co.

Automatic Stove Rooms
Philadelphia Drying Mch. Co.

Ball Mills
Hardinge Co.
Mueller Machine Co., Inc.

Bituminous Coal
Bowman Coal Co.
Seaboard Fuel Corp.

Brick Making Machinery
Chambers Brothers Co.

Caustic Soda
Clinchfield Products Corp.
Pennsylvania Salt Mfg. Co.

Ceramic Chemicals
Drakenfeld Co., B. F.
Harshaw, Fuller and Goodwin Co.
Metal & Thermit Corp.
Paper Makers Importing Co., (Inc.)
Roessler and Hasslacher Chemical Co.
Vitro Mfg. Co.

Ceramic Plant Equipment
Chambers Brothers Co.
Mueller Machine Co., Inc.
Philadelphia Drying Machinery Co.
Proctor and Schwartz, Inc.

Clay (Abrasives)
Old Hickory Clay & Talc Co.

Clay (Ball)
Old Hickory Clay & Talc Co.
United Clay Mines Corp.

Clay (China)
Clinchfield Products Corp
Edgar Brothers Co.
Drakenfeld and Co., B. F.
Golding Sons Co.
Old Hickory Clay & Talc Co.
Paper Makers Importing Co., (Inc.)
Roessler & Hasslacher Chemical Co.
United Clay Mines Corp.

Clay (Electrical—Porcelain)
Clinchfield Products Corp.
Edgar Brothers Co.
Old Hickory Clay & Talc Co.
Paper Makers Importing Co., (Inc.)
United Clay Mines Corp.

Clay (Enamel)
Clinchfield Products Corp.
Edgar Brothers Co.
Metal & Thermit Corp.
Old Hickory Clay & Talc Co.
The Vitro Manufacturing Co.
United Clay Mines Corp.

Clay (Fire)
Edgar Brothers Co.
Old Hickory Clay & Talc Co.
Paper Makers Importing Co., (Inc.)
United Clay Mines Corp.

Clay (Potters)
Clinchfield Products Corp.
Old Hickory Clay & Talc Co.
United Clay Mines Corp.

Clay (Sagger)
Edgar Brothers Co.
Old Hickory Clay & Talc Co.
Paper Makers Importing Co., (Inc.)
United Clay Mines Corp.

Clay Handling Machinery
Hadfield-Penfield Steel Co.
Mueller Machine Co., Inc.

Clay Miners
Edgar Brothers Co.
Old Hickory Clay & Talc Co.
United Clay Mines Corp.

Clay (Wall Tile)
Old Hickory Clay & Talc Co.

Clay Washing Machinery
Mueller Machine Co., Inc.

Clay Working Machinery
Hadfield-Penfield Steel Co.
Mueller Machine Co., Inc.

Coal-(Bituminous)—
Bowman Coal Co.
Seaboard Fuel Corp.

Colors
Drakenfeld and Co., B. F.
Early, Joseph N.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.
Vitro Mfg. Co.

Conditioning Machinery
Philadelphia Drying Machinery Co.

Conical Mills
Hardinge Co.

Controllers
General Electric Co.

Conveyors (Clay, Sand, Brick, etc.)
Hadfield-Penfield Steel Co.
Philadelphia Drying Machinery Co.
Mueller Machine Co., Inc.

Controllers (Automatic Temperatures)
Brown Instrument Co.
Charles Engelhard, Inc.

Cornwall Stone
Golding Sons Co.
Pennsylvania Pulverizing Co.

Crushers
Chambers Brothers Co.
Hadfield-Penfield Steel Co.
Hardinge Co.
Mueller Machine Co., Inc.

Decorating Supplies
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.
Vitro Mfg. Co.

Disintegrators
Chambers Brothers Co.
Hadfield-Penfield Steel Co.
Mueller Machine Co., Inc.

Dryers (China Ware—Porcelain)
Philadelphia Drying Machinery Co
Proctor and Schwartz, Inc.

BUYERS' GUIDE (continued)

Drying Machinery
Philadelphia Drying Machinery Co.
Proctor and Schwartz, Inc.
Manufacturers Equipment Co.

Electrical Instruments
Brown Instrument Co.
Charles Engelhard, Inc.
Wilson-Maeulen Co.

Electrical Porcelain Machinery
Mueller Machine Co., Inc.

Enameling Equipment, Complete
Chicago Vitreous Enamel Product Co.
Electro-Alloys Co., The
The Porcelain Enamel & Mfg. Co.

Enameling Furnaces
Chicago Vitreous Enamel Product Co.
General Electric Co.
The Porcelain Enamel &Mfg. Co.
U. S. Smelting Furnace Co.

Enameling Furnaces (Electric)
General Electric Co.

Enameling Muffles
General Electric Co.
Parker-Russell Mining & Mfg. Co.

Enameling, Practical Service
Chicago Vitreous Enamel Product Co.
Electro-Alloys Co., The
The Porcelain Enamel & Mfg. Co.

Enamels, Porcelain
Chicago Vitreous Enamel Product Co.
Early, Joseph N.
The Porcelain Enamel & Mfg. Co.
The Vitro Manufacturing Co.

Engineering Service
Chambers Brothers Co.
Electro-Alloys Co., The
Hadfield-Penfield Steel Co.

Equipment (Electrical)
General Electric Co.

Extruding Machines (Lab. Use)
Chambers Brothers Co.

Feldspar
Clinchfield Products Corp.
Drakenfeld and Co., B. F.
Feldspars Limited
Golding-Keene Co.
Golding Sons Co.,
Harshaw, Fuller and Goodwin Co.
O'Brien and Fowler
Old Hickory Clay & Talc Co.
Pennsylvania Pulverizing Co.
Roessler & Hasslacher Chemical Co.
United Clay Mines Corp.

Filtering Machinery
Mueller Machine Co., Inc.

Fire Brick
Parker-Russell Mining & Mfg. Co.

Flint
Clinchfield Products Corp.
Golding Sons Co.
Golding-Keene Co.
Pennsylvania Pulverizing Co.

Fuel
Bowman Coal Co.
Seaboard Fuel Corp.

Furnaces
Chicago Vitreous Enamel Product Co.
Parker-Russell Mining & Mfg. Co.
The Porcelain Enamel & Mfg. Co.
The Surface Combustion Co.
U. S. Smelting Furnace Co.

Furnaces (Electrical)
General Electric Co.

Glazes and Enamels
Chicago Vitreous Enamel Product Co.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.
Vitro Manufacturing Co.

Gold
Drakenfeld, B. F. & Co.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.

Impervite (Refractory and Hard Porcelain)
Charles Engelhard, Inc.

Iron (Enameling)
United Alloy Steel Corp.

Jiggers
Hadfield-Penfield Steel Co.
Mueller Machine Co., Inc.

Kaolin
Edgar Plastic Kaolin Co.
Harshaw, Fuller and Goodwin Co.
Old Hickory Clay & Talc Co.
Roessler & Hasslacher Chemical Co.
United Clay Mines Corp.

Kryolith
Pennsylvania Salt Mfg. Co.

Metals (Porcelain Enameling)
United Alloy Steel Corp.

Mills *(See under Ball Mills)*
(See under Pebble Mills)

Minerals
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.
The Vitro Manufacturing Co.

Mixing Machines
Chambers Brothers Co.

Muriatic Acid
Harshaw, Fuller and Goodwin Co.
Pennsylvania Salt Mfg. Co.
Roessler and Hasslacher Chemical Co.

Operators (Coal)
Bowman Coal Co.
Seaboard Fuel Corp.

Oxides
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Paper Makers Importing Co., (Inc.)
Pennsylvania Salt Mfg. Co.
Roessler and Hasslacher Chemical Co.
The Vitro Manufacturing Co.

Pans (Wet and Dry)
Chambers Brothers Co.
Hadfield-Penfield Steel Co.
Mueller Machine Co., Inc.

Pebble Mills
Hadfield-Penfield Steel Co.
Hardinge Co.
Mueller Machine Co., Inc.

Placing Sand
Pennsylvania Pulverizing Co.

Plate Feeders
Chambers Brothers Co.
Hadfield-Penfield Steel Co.

Porcelain Enameling Service, Practical
Chicago Vitreous Enamel Co.
The Porcelain Enamel & Mfg. Co.

Porcelain Enamels
Chicago Vitreous Enamel Product Co.
Early, Joseph N.
The Porcelain Enamel & Mfg. Co.
The Vitro Manufacturing Co.

Pottery Machinery
Hadfield-Penfield Steel Co
Mueller Machine Co., Inc.

Powdered Enamel
Early, Joseph N.

Pug Mills
Chambers Brothers Co.
Hadfield-Penfield Steel Co.
Mueller Machine Co., Inc.

Pulverizing Machinery
Hadfield-Penfield Steel Co.
Hardinge Co.
Mueller Machine Co., Inc.

Pulverizing Mills
Hadfield-Penfield Steel Co.
Hardinge Co.
Mueller Machine Co., Inc.

Pumps
Mueller Machine Co., Inc.

Pyrometers (Indicating)
Brown Instrument Co.
Charles Engelhard, Inc.
Wilson-Maeulen Co., Inc.

Pyrometers (Recording)
Brown Instrument Co.
Charles Engelhard, Inc.
Wilson-Maeulen Co., Inc.

Pyrometer Tubes (Refractory and Hard Porcelain)
Brown Instrument Co.
Charles Engelhard, Inc.
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co

Quartz
Old Hickory Clay & Talc Co.

Recording Instruments
Brown Instrument Co.
Charles Engelhard, Inc.
Wilson-Maeulen Co., Inc.

Refractory Materials
Parker-Russell Mining & Mfg. Co.

Regulators (Automatic Temperatures)
Brown Instrument Co.
Charles Engelhard, Inc.
Wilson-Maeulen Co., Inc.

Sagger Presses
Chambers Brothers Co.
Hadfield-Penfield Steel Co.
Mueller Machine Co., Inc.

Shippers (Coal)
Bowman Coal Co.
Seaboard Fuel Corp.

Silica Brick
Parker-Russell Mining & Mfg. Co.

Silex Lining
Hardinge Co.

Selenite of Sodium
Drakenfeld and Co., B. F.
Metal & Thermit Corp.
Vitro Mfg. Co.

Smelters
Parker-Russell Mining & Mfg. Co.
The Surface Combustion Co
U. S. Smelting Furnace Co.

Sodium Antimonate
Metal & Thermit Corp.

Spar
Clinchfield Products Corp.
Feldspars Limited
Golding Sons Co.
Golding-Keene Co.
Pennsylvania Pulverizing Co.

Sulphuric Acid
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Pennsylvania Salt Mfg. Co.
Roessler and Hasslacher Chemical Co.

Temperature Instruments (Measuring)
Brown Instrument Co.
Charles Engelhard, Inc.
Wilson-Maeulen Co., Inc.

Thermalloy Enamel Burning Equipment
Electro-Alloys Co., The

Thermalloy Point Bars
Electro-Alloys Co., The

Thermalloy T-Bars
Electro-Alloys Co., The

Thermometers (Electric Resistance)
Brown Instrument Co.
Charles Engelhard
Wilson-Maeulen Co., Inc.

Tile Machinery (Floor and Wall)
Mueller Machine Co., Inc.

Tubes (Insulating)
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co.

Tubes (Pyrometer)
Brown Instrument Co.
Charles Engelhard, Inc.
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co.

Vacuum Pumps
Mueller Machine Co., Inc.

Wet Enamel
Early, Joseph N.

Whiting
Clinchfield Products Corp.
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.

Zirconia
Vitro Mfg. Co.

ALPHABETICAL LIST TO ADVERTISERS

CLASSIFIED ADVERTISING

Professional Services

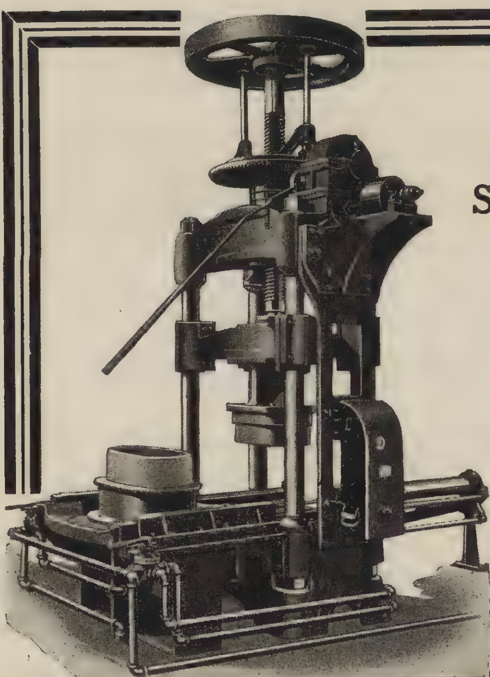
Being an engineer will not guarantee employment of your services — You must tell what you have done and can do—Let those who need your services know about you and your ability.

CERAMIC ENGINEER desires new connection. Very good executive and laboratory experience in hollow tile and architectural terracotta manufacture. Wishes to locate in the East, preferably Maryland, address this Journal "Box 63" 211 Church St., Easton, Pa.

WANTED to buy a small vertical pug mill and a hand operated sagger press. Give full information as to manufacturer, condition, size, capacity and price. Address "PM. SP." this Journal 211 Church Street, Easton, Pa.

WANTED: Position by practical man who understands the manufacture of different kinds of pottery, including Delft ware, etc., and the expert handling of pastes, colors and enamels. Fifteen years' experience. Graduate of Dutch Art Academy and Pottery Academy Hobe, Germany. Address "Box 62," American Ceramic Society, 211 Church Street, Easton, Pa.

(When writing to advertisers, please mention the JOURNAL)



BULLETIN
of the
American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Vol. 2 March, 1923 No. 3

EDITORIALS

OUR SILVER JUBILEE

Industrial ceramics has had twenty-five years of unselfish promotion of art and science; first by the ten men who originated the idea of a Society for this purpose, then by the twenty-one men who were the charter members and lastly by the nineteen hundred members of the American Ceramic Society. A quarter of a century has passed since the original ten met in Pittsburgh to discuss the advisability of organizing a coöperative means of obtaining and disseminating data and information on technical and scientific ceramic problems. Five of the original ten men met in Pittsburgh on the twelfth of last February with five hundred other ceramists to celebrate the twenty-fifth anniversary of that first council of ten, and to consider the technical and scientific problems of the present day ceramic manufacturing.

A visualization of the present day larger appreciation by manufacturers of the service rendered by the American Ceramic Society may be had from the fact that four years ago the entire Convention was held in the room which this year the Whitewares Division alone crowded. Four years ago the Divisions were not organized; this year seven Divisions held two sessions on each of the two days with programs that totaled 190 original contributions, several committee reports, discussions and questions.

The large attendance, the excellence of the entertainment by the Pittsburgh Section and particularly the large amount of valuable information developed by the "seven conventions in one" fittingly honored that meeting of the original ten men of twenty-five years ago. The rapidly increasing attendance at these Conventions is evidence that organized coöperation in the creation and dissemination of technical and scientific ceramic knowledge is of increasing value to ceramic manufacturing.

TECHNICAL INVESTIGATION AND RESEARCH BY TRADE ASSOCIATIONS

Associations of manufacturers of like products are organized primarily for collective search for the most economical tariff, traffic, labor, manufacturing and management terms and means. In this they are coöperating directly with such of the public as are interested and with the federal and state authorities representing the public at large. Trade associations in America have increased in numbers until now there are several hundred whereas twenty-five years ago there were only a few. Trade associations are recognized as essential to the economic welfare not only in this country but also in all countries where manufacturing is carried on to any extent.

Manufacturers in America have had many years' experience with legal restraints and it should be expected that price fixing and other practices unfair to the public should continue to be subject to rigid restraint. The limiting laws of today, however, are not in harmony with the need of cooperation in business. The Sherman Act was directed against consolidations of capital at a time when collective action through trade associations was not a factor either in manufacturing or business. Consolidation of capital that eliminates competition is a vastly different thing from collective action through trade associations. The former is often (although not always) without regard to public welfare whereas trade association activities have been most largely of direct benefit to the general public. Consolidation of capital gives domination in business; collective activity through trade associations develops individualism, improves business standards and eliminates waste in production and distribution. Trade associations are the essential contact agents for government bureaus, and the effectiveness of government bureaus in their aid to manufacturers has increased with the increase in strength of the trade associations. Coöperative investigations supported by producers, consumers and the public are possible only when the producers and consumers each are organized.

It is true that evil practices are possible with trade associations. Any collective activity can be used for conspiracy against public interests and trade associations are no exception.

Among the most beneficial activities of trade associations are those that will improve quality of product, stabilize labor relations, and reduce cost of manufacturing. Technical investigations, standardization of materials and products, and elimination of wastes are the means by which trade associations obtain these results.

The AMERICAN CERAMIC SOCIETY through its officers and committees is pledged to promote investigations by trade associations in coöperation with such research organizations as federal bureaus, Mellon Institute and the commercial laboratories. Coöperative investigation by trade associations brings the needs and the benefits directly to managing employers; insures engagement on the most essential and vital problems; stages the investigation on plant conditions and takes recognition of the viewpoints of the supporting firm members, thus making the data, observations and conclusions of immediate and direct benefit and value. This short cut contact between the several plants and the central laboratory with its broadening influence alike on the plant operators and the investigators can be had in no other way than through trade associations. It clears away the secrets in manufacturing which have made the application of results of research so slow in the past. It makes possible a study of problems on a large scale in an authoritative manner, establishing more economical production practices. When an association of users will collaborate with an association of producers on a problem, ware of the required quality will be produced and marketed to the advantage of both parties and to the public at large.

The function of the AMERICAN CERAMIC SOCIETY in this scheme of coöperation affects in no wise this direct contact between the association of producers and the research laboratories. There is a need for the AMERICAN CERAMIC SOCIETY devoted as it is exclusively to the promoting of research agencies and activities, gleaning all the information extant from the world's literature, making and preserving records of research, data and observations and in every other possible way not only building up a fund of information regarding materials, processes and products but also promoting the means of obtaining this information. The practical value in the work of the AMERICAN CERAMIC SOCIETY lies in the fact that it represents all ceramic industries and therefore brings to each all of value that has been obtained by the others. All ceramic manufacturing has many things of common interest. It may seem to be a "long cry" from the manufacture of glass or enameled ware to the manufacture of bricks, yet to one familiar with the technology involved there are practices, materials and processes that are common to each. It is much easier to see the similarity in problems of the whitewares group of manufacturers or in those of the heavy clay product group. There is value in manufacturers of a like product associating together on a program of technical investigation

through their trade association and by the same token there is value in all manufacturers having problems common to each being associated together.

The trade associations have found and proven the value in coöperative research. Some of them have continued their coöperative investigations over a period of years with increasing financial support. It is the hope of those who labor in the AMERICAN CERAMIC SOCIETY that every ceramic trade association will be so engaged.

The public and the legislators will soon realize the wide distinction between combined capitalization, in which individual concerns are merged, and the trade associations in which the individual concerns not only maintain their individuality but are strengthened in their economic and manufacturing position as individual concerns. Coöperation with their fellows and with representatives of the public on problems that affect directly the cost of production and distribution and the quality of the ware is a healthy combination of interests. If the AMERICAN CERAMIC SOCIETY can be as influential in promoting coöperative research by trade associations as it has been in promoting the establishment of government laboratories and collegiate ceramic departments it will have justified its support by manufacturers of ceramic products. This SOCIETY must continue to justify its existence by actual accomplishments, and no avenue for accomplishment is more productive than the promotion of technical investigations by trade associations.

PAPERS AND DISCUSSIONS

DISCUSSION ON "REFRACTORIES FOR OIL-BURNING FURNACES"[1]

By R. L. FRINK:—In the October issue of the *Bulletin of the American Ceramic Society*[2] I was much interested in the discussion on refractories for oil burning furnaces, and particularly the remarks made by my old friend, Mr. Greaves-Walker, regarding the effect of oil upon refractories, which he describes as a rotting, due to the impingement of the oil upon the surface of the brick and the minute explosions which take place, his theory apparently being that because of these minute explosions and the extremely high temperature occasioned at the instant of the explosion there is a disintegration of the surface. While he does not say that exactly, yet, to my mind, it is the only inference that can be made from the theory as expressed.

I am in part inclined to this theory but not in the effect which I infer from his statement, *i. e.*, that there is sintering or actual fusion of the brick at the instant of these explosions and a subsequent disintegration because of continued or repeated explosions, for if such were the case the surface of the brick would not have the appearance of being rotten, as he expresses it, but would be more inclined to have the appearance of glazed or vitrified surface and while it is true that in many instances this is the characteristic of surfaces obtained the majority of surfaces are quite different. Therefore I venture to present another theory, which I suggested some years ago before the SOCIETY as relating to the effect of water smoking upon the chemical and physical characteristics of clays. That is, the effect of a sudden or pronounced increase of temperature over local areas in comparatively short periods of time, when such areas of clay have been subjected to a water smoking condition or the absorption and adsorption of compounds of hydrogen and carbon, as tar, soot or the absorption of hydrogen carbon gases; and then if temperatures are produced which before complete oxidization of this carbon occurs there is a temperature gradient within the clay sufficient to disassociate the hydrogen and silicon the presence of a moisture compound of silicon and hydrogen will be formed, with the result that the free silica or silica which is in excess as related to other components of the clay will be removed in the form of a gas of the methane, acetylene and other series of hydrogen silicon compounds, leaving behind a more or less porous mass whose surface is usually discoloured by a re-disassociation of the silicon hydride compound and precipitation of silicon.

I remember quite distinctly that some years ago when discussing this theory, it created considerable amusement. However, I think that later

[1] Received November 21, 1922.

[2] *Bull. Amer. Ceram. Soc.* **1** [10], 229(1922).

it was conclusively proved, although whether or not it became generally known I do not know, that in the making of paving brick, the density, resistance to abrasion or rattle test and other qualifications were, in one or two plants, quite satisfactorily controlled, particularly in oil fired kilns by regulating the relation between oil vapor or gas, steam and air, all of them being related to temperature produced within the kiln.

Noticing this discussion of Mr. Greaves-Walker, it occurred to me that reopening our old controversy might enliven a subject which, if thoroughly investigated, would not only be interesting but helpful and important to the clay industry generally.

I might also call attention to a recent experience in the burning of heavy Mexican oil, in which we obtained an effect similar to that which Mr. Greaves-Walker describes, *i. e.*, the rotting of the brick and also the opposite effect of glazing, but in this instance it was found that the glazing took place at remote or distant corners of the furnace where there was no direct impingement of oil or oil vapor upon the surfaces of the brick and this blaze was a brownish or black color and was primarily caused by the presence of sulphur, tellurium and vanadium while the rotting or disintegration of the brick was of a character which could be accounted for by the theory above expressed, for upon chemical and physical examination of the surfaces and the structure of the remaining refractory material, it was quite evident that a considerable quantity of silica had been removed.

Glass Research Association
London, England

DISCUSSION ON "CALCINING OF CLAYS"[1]

(1) Has there been any kiln designed and in use which will successfully calcine run-of-mine plastic fire clay to a temperature of cone 6–8?

(2) What is the most economical method of calcining clays? Compare calcining in ordinary kilns, in perpendicular furnaces, and in rotary kilns.

(3) What is the best and cheapest fuel to use in rotary kilns? What is the approximate cost to install, and operate, and the approximate capacity? Can powdered coal be used when calcining at a high temperature without injuring the clay?

Mr. Greaves-Walker:—We have here this morning a rotary kiln expert. I do not know that he has ever gone into the question of calcining clays but the operation of the kiln would be the same in any industry. Some of you have undoubtedly had experience in calcining clays in up-draft kilns. I know that some of you have had experience in calcining in ordinary down-draft kilns hence we should get a very good discussion.

Mr. Austin will start the discussion on this subject and give his opinion as to the usefulness of the rotary kiln as compared with the down-draft kiln.

[1] Refractories Division, St. Louis Meeting, February, 1922.

MR. AUSTIN:—Of course, for calcining I approve of the rotary kiln, but it all depends on just how much calcining you have to do and also on the fuel. The fuel would depend on where your kiln was located. You can burn very successfully with oil, gas, and dust coal.

As to the installation, you can make it cost most anything that you want for there are so many different types. When calcining clay you can get perfect combustion. A great deal depends on the operator of the rotary as to the production of such a kiln. There are so many different angles to it that I do not know where to commence but I will try to answer questions.

MR. GREAVES-WALKER:—Can you give us an idea what a small rotary kiln installation, the smallest installation you recommend, would cost?

MR. AUSTIN:—To begin at the fuel end, we have to have pressure to handle the fuel, and the amount of pressure needed will depend upon both the fuel and the clay.

There are so many old rotary kilns in this country, if you want to make an economical installation you can pick one up for very little money. Then again it depends on where you are located.

There are many one-unit installations for grinding coal; and a great many in other fields. These are high speed equipments that go to pieces quickly.

Again you can use fuel oil. There are many different systems for fuel oil each having certain advantages.

You can put in a one-unit installation for $2000 that will give you a production from 48 to 75 tons a day.

MR. GREAVES-WALKER:—I think this question of calcining clays is of interest to a number in the fire clay business, especially those in the St. Louis district, because here the crudest method is used, that of calcining in down-draft kilns. This is, undoubtedly, the most expensive method.

With the necessity for reduced costs, the time has come when it is important to find more economical methods of calcining clays. They are shipping clays a greater distance now than ever before and even this attempt at saving in freight by calcining at the mines is at the present rates worth while. There is the question whether it would be better to calcine at the mines or whether it is worth while hauling that moisture in bulk from the clay mines to the clay plants.

MR. KRUSEN:—Would the use of powdered coal for fuel in a rotary kiln have any effect on the clay?

MR. AUSTIN:—You would have the ash, but if you use white ash coal, it would not affect the clay so much. It might run the silica higher.

My idea of a clay kiln is different from most other kilns for the reason that with clay you would not have to do any extra calcining and the operation could be done very quickly. The cement proposition as you know is different.

I believe you could calcine clay by closing up everything and getting almost perfect combustion. You still get your ash but you could easily take care of that in a small kiln. You would not need any stack draft, hence it would be very economical. Personally, I prefer dust coal to any other fuel; you can get any kind of a fire you want without any loss of fuel. When you use fuel oil, you have an atomizer to contend with, and if it does not atomize properly, you do not get good results.

Mr. Harvey:—I would like to inquire to what percentage the ash will reach. How much coal do you have to use per ton of clay calcined? Calcining usually runs about cone 6 to 8. If you know how much coal you are going to use, you can easily figure out what the percentage ash will be. Then you can tell how much it will lower the fusion point of the clay.

Mr. Austin:—That is something else. Every rotary kiln which I have installed, with one exception, has operated at a very high temperature. Where we burned to cone 20, with a particular coal, it took about 30% of fuel based on the amount of dead burning material, or about 600 pounds to the ton. You get 30% of fuel for the amount of tonnage that comes out. Of course, with clay there would be a considerable increase over this in tonnage production per amount of fuel used.

Mr. Harvey:—Do you mean 600 pounds of powdered coal per ton of finished product up to cone 20?

Mr. Austin:—Yes, sir.

Mr. Roy G. Smith:—Mr. Austin has had experience with rotary kilns at high temperatures. We have had experience with rotary kilns at low temperatures. Perhaps between the experience of us both we may get somewhere in this figuring.

We have a plant that makes face brick from a low grade of fire clay. This plant made pressed face brick for a good many years until they got the idea that they could make stiff-mud brick to better advantage. They installed a stiff-mud outfit, as we use those words in the clay industry. They found that the drying shrinkage of this clay was such as to rupture the brick before they got dry and hence it was necessary to use grog in order to get the brick through the dryer. We came to the conclusion that the rotary kiln would be the only possible way of making grog in sufficient quantities.

We installed a rotary kiln, 6 x 60 feet. This one cost us $3500. It was twenty years old and originally cost $3000. The entire installation cost us $20,000. However, about one-half of that was clay handling equipment which might not be considered essential to the rotary kiln installation.

The preparation of the material is very important, and also the disposition of it after it is calcined. Coming out of the rotary kiln in quan-

tities, after being at that high temperature it is very difficult to handle. It is necessary to have a mechanical feeder of some kind to put it in. If you have large lumps or wet clay, you have another problem on your hands.

We installed this rotary kiln under a clay chute at the railway track, about 28 feet off the floor line, and put a pan under the track. We dump directly from the car into the pan, put a feeder under the pan, feeding into a cast iron chute at the upper end of the kiln, and discharging at the lower end into a steel elevator and from this to an overhead conveyor which discharges the burned clay into the dry pans in proper proportions with the raw clay.

This kiln, as I said, is 6 x 60 feet. It makes one to two revolutions a minute. We use a variable speed motor drive. It takes 15 h. p. to run the kiln and 10 h. p. to run the feeder.

We use fuel oil, and find that $7^1/_2$ gallons of fuel oil is used to produce a ton of clay. However, our temperature only goes to 1000° to 1200°F, as the nature of this clay is such that the shrinkage is practically taken out of it at that temperature.

The lining and the fuel, the clay supply, and the clay disposition after it is burned seem to me to be the governing factors rather than the rotary kiln itself, so it is just a question of getting these things lined up to accomplish whatever you start out after. As Mr. Austin suggests, each problem would have to be studied by itself, and proper arrangements made to meet these peculiar conditions in each particular installation.

Mr. Greaves-Walker:—Mr. McDowell, your Company, I believe, has attempted to use shaft kilns at some plant in Pennsylvania for calcining clays? Have you any information you could give the gentlemen on the method?

Mr. McDowell:—That method was not applied by us on plastic clays.

Mr. Greaves-Walker:—I think the same thing would apply. The difficulty with most methods, either the rotary kiln or the others, is in handling finely-divided clay, that is the clay that is crushed down. Of course, in the rotary you crush it down, the smaller the better within certain limits, but I think the great question to everybody who has not used a shaft kiln, is how they can handle the fines, *i. e.*, whether they can use the kiln run of calcined clay or will have to separate the fines. Can you give us any information on that?

Mr. McDowell:—We used no fines in those kilns. The material fed into them is entirely clay lumps.

Mr. Christopher:—Our shaft kiln is fed directly from box cars, and discharges at the bottom from which we haul in trucks to cars. This kiln will hold three ordinary box car loads or about 140 to 175 tons of clay. We use lumps and do not use frozen clay for it would crack and all go to fine clay thus choking the kiln.

This kiln is about 28 to 30 feet high and about 14 feet inside diameter. We burn this 140 or 150 tons of clay to a red heat with coal. I have burned that kiln off with as low as 18 tons of coal.

Mr. Greaves-Walker:—Mr. Christopher, can you not work that as a continuous kiln, merely taking it out at the bottom as you put it in the top?

Mr. Christopher:—I see no reason why it could not. Our kiln, however, was not built on piers. It was built on the ground.

There is no reason I know of, especially if you get choice flint clay, why you could not have the kiln right at the loading station along the railroads. In that case you could build the kiln on piers and have the firing platform above, much the same as with lime kilns. I rather believe McLean tried that at Rosewood.

Mr. Krusen:—I believe he burned off something like 10 or 15 cars of clay altogether in that kiln, but he tried to use clay from the pit that was very plastic. It was not in big lumps. When they used large lumps they were rather successful, but his idea was to use clay from the pit. At that time nearly all the available clay was not in lumps but I think his plan was fairly successful for large lumps.

Mr. Schwetye:—We haven't found any difficulty in calcining clay in a round down-draft kiln. When we use only lumps, we get a better draft, it will burn better, but you can use a certain percentage of fines.

Mr. Greaves-Walker:—What is the fuel consumption?

Mr. Schwetye:—Burning up to cone 12, the fuel consumption will run about one-half ton of coal to a ton of clay.

Mr. Christopher:—In calcining clay in a round down-draft kiln, the biggest coal saving that I know of is to be sure that your flue openings are open after your kiln is set. Our kilns have 40 to 50 square floor openings, each of which opening is covered with three flat tiles, three high. On top of these tile we set a 9″ round refractory tile similar to a chimney tile. After everything is set we take a long iron rod and spread the tile directly over floor opening so as to allow proper draft.

These floor tile on the bottom must be properly spaced and the clay punched out of them. In that way we can save about 40% of our fuel. I find that you can save more coal and more time with an hour's work in that way than you can in any other.

Mr. Geiger:—I should like to ask two questions, first as to handling of block plastic clay in calcining and what the cost per ton is for firing plastic clay to cone 12, regardless of the method and regardless of the treatment given it beforehand.

Mr. Greaves-Walker:—Mr. Talbot, you have had some experience in running out fire clay into blocks.

Mr. Talbot:—In our experience, we found that it is better to grind the clay, then form and set them just as we do brick. If I remember correctly, it used to run around 1600 pounds of coal to the 1000 brick. This made the yield about $3^1/_2$ tons of clay to the ton of coal.

DISCUSSION[1] ON "MECHANICAL METHODS FROM CLAY BANK TO MACHINE"

Mr. Tefft:—This is a subject we are all interested in because there is such an opportunity to improve most of our plants with labor-saving devices. While it is impossible to apply the same remedy for correction of costly clay gathering apparatus to each plant I am sure that a general discussion now will bring out certain methods that can be applied in most cases.

Mr. Langworthy:—It is rather difficult to participate in a discussion of this sort as there are so many different methods that are satisfactory depending upon the actual problem. It is my judgment that each individual case must be studied before a definite plan for handling the clay can be made up.

A Member:—I want to put in a system of some kind to get the clay from our shale pits into the plant. I am figuring on belt conveyors and in one place in our plant, we have a "button" conveyor that is about 60 or 70 feet long which works very satisfactorily. I should like to know where anyone has used the "button" conveyor. What I have reference to is a wire cable operating in a trough, this cable being equipped with metal buttons spaced short distances apart.

In my case, I think they are 14 inches apart with 6- or 8-inch buttons. This operates very satisfactorily in a small way. If the clay is a little bit wet the buttons or the cable will ride on top of the clay, but if a hump is put in there is no trouble.

I once discovered one of the men riding this conveyor to hold the cable down. The clay will stick in the bottom and the button will creep up over it if it is not forced down or have a hump over which to travel.

Mr. Smith:—Do you put that hump in there in order to force the buttons to the bottom of the trough that they run in?

A Member:—Yes.

Mr. Smith:—You are then building up friction against which you are pulling.

Mr. Brown:—I have had experience with "drag conveyors." There is a conveyor in which the belt is supported underneath by means of boards or metal plates instead of rollers and contrary to all expectations, they

[1] Heavy Clay Products Division, St. Louis Meeting, February, 1922.

have given excellent service and proved to be durable. It is obvious that they must consume more power than when the belt is supported on rollers, especially if the roller axles are provided with good bearings.

I have supplied the metal parts for "drag conveyors" at various times under protest and witnessed them in operation in various lengths to 80 and 90 feet long and was surprised to find them giving satisfactory results over a long period of time.

As compared to a conveyor having the belt supported by concentrating or troughing rolls, I am certain the latter will show a decided saving in power.

Mr. Tefft:—If the distance is not extreme I believe a belt conveyor is more satisfactory for most conditions than any other installation unless it is applied to a place where either the discharge end or the feeding end is a movable proposition. In such a case I believe you would spend more money on the conveyor to keep up with these moves than you would get out of it while it is in operation.

Mr. Brown:—I am not a clay worker but an engineer specializing in clay working machinery and in our practise, we have found that for comparatively short distances and with dry material the "button" conveyor will work successfully. We have tried to improve the belt conveyor as this type requires less power and when correctly built, will outlast the "button" type of conveyor and has greater capacity. It will work in short lengths or in long lengths up to several hundred feet long.

For handling waste clay in the machine room where the particles of clay are wet and surfaces somewhat oily from passing through a cutter, a flat belt conveyor is generally most satisfactory. In the storage shed and when handling raw clay, it is best to use concentrating or troughing rolls under the belt to prevent material from falling over the edge of the belt.

These rolls should be equipped with good self-oiling bearings, something that will not require frequent attention and will keep the bearings properly lubricated and exclude dirt.

With a properly designed and built belt conveyor, the installation will work continuously for years with a minimum of expense and attention. With the addition of a tripper, it can be made to discharge at any point along its length.

Mr. Tefft:—Our experience has been the same as Mr. Brown's. We have in our Milton Plant a 20-in. wide belt conveyor that is 115 feet long and another one that is about 150 feet long. They are, of course, under cover so that the belt is protected from the weather. With this protection we find that these belts will last several years.

I know one of the belts that we only recently took off had been on there for seven years.

We find however that where the loading point is changing it is very hard to beat a locomotive with cars. The conveyor is all right if you have the right type of shale planer, *i. e.*, one that works on a pivot and does not have to travel back and forth across a long face. Is that the type you have?

A MEMBER:—Yes.

MR. TEFFT:—We are using an Arbuckle type cutting a face about 300 feet long. We feel that it would cost us more to get conveyors up to the machine and keep them traveling with it at successive moves of the planer into the hill than it would to put the clay in cars and pull them with a locomotive. Mr. Smith, I believe you said your experience was the same.

MR. SMITH:—Yes, that has been my experience. We have another plant where our clay pit lies directly below the clay shed. There we use the truck car. This is an ideal condition. It is an illustration of the point that you must base each problem on its merits and settle it according to what you find.

MR. BROWN:—It is customary in a lot of plants to bring the clay up to the foot of an incline by means of a locomotive or a horse and then elevate it by means of a winding drum. A lot of these plants by making their incline longer could take it all of the way with their locomotives and save two or three men in that way. The hauls generally are short and you could extend the tramway back toward the pit so as to make the haul the entire distance by means of a light locomotive. There are many gasoline-driven locomotives that are more economical to operate than a steam locomotive.

The steam locomotive generally is heavier and should haul longer trains, that is, more cars, but you can haul enough generally with a three-ton or a four-ton locomotive and you can make your tramway heavy enough to carry that locomotive and three cars. You can also save the winding drum and the men required to operate it, and I think that in changing or designing a plant in the future, that should be taken into consideration because you want to save as many men as you can.

MR. SMITH:—Mr. Brown, what do you consider the maximum grade that is economical for operating a locomotive as compared with the winding drum?

MR. BROWN:—An 8% grade is supposed to be the maximum at which they can be operated successfully. They do not really work to advantage on steeper grades.

MR. SMITH:—With a train of four yard cars what would you consider the maximum grade one of the locomotives would climb efficiently and economically?

MR. BROWN:—I am not advertising our locomotive. Any locomotive

could haul one-fourth its own weight, that is, the draw-bar pull should be one-fourth its own weight, and the draw-bar required to move a ton of material is something like thirty pounds, and then for every 1% of grade incline twenty more pounds would be added, making thirty pounds. For instance, if you have an 8% grade, that is 160 pounds plus 30, making 190 pounds draw-bar pull required to haul a ton up that incline. The weight of the locomotive in that case was five thousand pounds from $^1/_5$ to $^1/_4$ the weight of the locomotive would be your draw-bar pull under these conditions. An 8% grade is a rather difficult grade for a locomotive, since they do not hold to the tracks as well as on the level ground.

The above are approximate figures only as each case must be regarded as an individual case.

A good idea of what is possible may be had when I tell you that on a straight and level track, with cars equipped with a high grade of ball or roller bearings in good order and properly lubricated, seven pounds draw-bar pull will move one ton and that in practice, from 20 to 60 pounds draw-bar pull is required to move one ton.

Therefore, it would seem to me that we are not giving sufficient attention to certain details such as grades, curves, weight of rails, condition of road bed, condition of cars, etc. as there is an opportunity for saving power and wear and tear all along the line whether you use a horse, winding drum, a locomotive or any combination of these.

A MEMBER:—We are doing what Mr. Brown has suggested by pulling our clay in with the locomotive. We get the locomotive behind the loads. We carry three-, four- or six-yard dump cars. From the block down to the by-pass track it is about 250 feet, and $7^1/_2$% grade.

A run is necessary at that grade, especially if the track is wet. We allow our empty cars to drop to the pit by gravity and these by-pass.

MR. BROWN:—What size locomotive have you?

A MEMBER:—Ten by sixteen, steam locomotive.

MR. STEVENS:—In connection with the general problem of the most economical way to transport raw materials to the plant, I think the most striking example of efficiency along that line that I have ever seen is of the Streator Brick Company at Streator, Illinois.

They use the large drag line, a Marion, it is called, a large-sized machine, and an extensive installation. The drag line is located on top of the shale bank, and they bring the shale up to the top of the bank to load the cars. The top of the bank is higher than the level of the plant, consequently the loaded cars go to the plant by gravity and then a special differential hoist arrangement is used whereby the pull of the loaded cars helps to pull the exemption back up. A drum will boost them along if this is not sufficient, but to a very considerable extent the gravity force of the loaded cars pull the empties back.

Mr. Tefft:—That is another example where it pays to study the peculiar situation that you have before you.

Mr. Potts:—I do not know anything about Mr. Vincent's conditions but it seems to me that a light locomotive and cars would put the clay in cheaper than the belt conveyor.

We have been using a locomotive made out of a Ford engine made by the Parkville Truck Company, costing less than $1500. That handles the car over an 8% grade without any trouble and the maintenance on it is very low; it takes about 4 to 5 gallons of gas a day, and probably takes between a pint and a half and a quart of oil—lubrication oil. One man can run it, and that man dumps his own car when he gets into the plant.

As I remember the conditions there, the bank is higher than the clay shed, and you are practically downgrade, or on the level with the loading. When we bought the locomotive we expected to have the same conditions but we discovered we had a drop there and that put us a little below our plant. I think you could buy the locomotive and cars for less than it would cost you for the best conveyor and the maintenance would not be much.

DISCUSSION ON "TENTATIVE SPECIFICATIONS FOR GLASS HOUSE REFRACTORIES"[1]

Mr. Ross:—During the year the Standards Committee of the Glass Division has been asked to prepare tentative specifications on lime for use in glass and on refractories for use in the glass industry. As Mr. A. E. Williams is particularly familiar with the specifications on lime, I have suggested that he take them in charge when they come up for discussion.

As to the Standard Specifications for Glass Industries Refractories, my personal opinion, after having worked with this matter for the last two and one-half years, is that our present knowledge of this subject is entirely too meager to permit of us drawing up satisfactory Standard Specifications at this time. I further believe that the present Committee's report might well serve as a basis for discussion at this meeting, which discussion may be of value to future committees dealing with Glass Industries' Refractories.

In conclusion, it appears to me that what we need now is more research along these lines and no final Standard Specifications except as each point is thoroughly proved out and that in this way injustice to any and all can be avoided.

The Committee's Report on Glass Industries Refractories follows:

[1] Glass Division, St. Louis Meeting, February 28, 1922.

REPORT OF COMMITTEE ON GLASS INDUSTRIES REFRACTORIES

Introduction

The effort of this Committee has been to develop a set of specifications that will aid the consumer in getting what he needs, and then obtaining the most service from what he gets, and at the same time to be a guide to the manufacturer in supplying it, without working a hardship on either. We believe that such a set of specifications, when ultimately worked out with proper limits, should even be an aid to the manufacturer in producing better grades of refractory wares.

Our aim has been to obtain limits that actually apply to the wares as now made, where possible pointing the way to better practice, and where it is necessary to apply tests, having them of such a nature that the results will distinguish clearly between satisfactory and unsatisfactory products. At the same time, knowing that a large percentage of the plants manufacturing and using these products are still unequipped with laboratories, it has been our aim to have all tests so arranged that they can be applied on any plant without special laboratory equipment. This has been done to permit of ready application of the specifications under existing conditions.

In so far as they apply the committee has endeavored to use the A.S.T.M. specifications for refractories, notably the reports of Committee C-8. However, there are several requirements that are essential to refractories used in the glass industries, that are of minor importance to refractories used in other industries. Hence it has been necessary to devise several more or less new tests. These have been worked out by observing the peculiarities of the various wares in service, and then selecting from the mass of laboratory tests on hand those which most clearly delimit (prescribe the limits of) the particular requirements under consideration.

The specifications herein set forth are of necessity of a tentative nature. We believe that the general plan will prove satisfactory, but that a great deal of thought must yet be given to the subject, and considerably more data be collected relative to proper limits, etc., before these tentative specifications can all be accepted as standard.

Many of the limits are already quite well established, while others need more weight of evidence.

Heat treatments are expressed in cone numbers, the temperature measuring instrument being depended upon merely to indicate the progress of the furnace. It is preferable however to use accurately calibrated instruments and record exact temperatures in addition to the cone numbers.

An effort has been made to correlate all the tests and their limits, so that one specification will not conflict with another.

It appears very desirable to have a hot bending test for pot clay at

glass melting temperatures, which in a measure at least will correspond to the bulging of pot walls. It also appears desirable to have a test which in a measure corresponds to the shrinkage that takes place in the pot while it is in the pot arch, and the additional shrinkage which must take place before the pot can be considered to be in a satisfactory condition for use.

The limits, etc., of the load test have been so thoroughly worked out that we believe there will be no need to alter them in the future. Hence, the results of such tests may well form a basis for correlation of other tests. 1 (*b*) and (*d*) have been worked out for use in lieu of the load test, where a load test furnace is not available.

Under Clay Refractory Blocks and Bricks, for Class A materials, the limits correspond to those usually used for first grade clay refractories, while for Class B materials, the limits include what are generally considered as second and third grade clay refractories. The limits of this test have been quite thoroughly worked out and correlated with results of the load test.

The limits, etc., for the hot bending tests and for volume change of pot clay during firing are not as thoroughly worked out as we hope to see them later.

Specifications

1. **Clay Refractory Blocks and Brick.—Class A:** Materials which are intended to be exposed to the direct heat of the furnace and to be either subject to the action of dust or not, but not to be in contact with the glass itself.

(*a*) These materials (cut to the form of standard 9-inch brick) when subjected to a load of 40 pounds per square inch, and heated as follows, in the usual form of load test furnace:

Time	Temp. °C	Time	Temp. °C
0 hr.	0.0	3 hrs.	1200
½ hr.	370.0	3½ hrs.	1270
1 hr.	670	4 hrs.	1320
1½ hrs.	880	4½ hrs.	1350
2 hrs.	1020	5 hrs.	1350
2½ hrs.	1120	5½ hrs.	1350
		6 hrs.	1350

Bricks so tested shall not yield in compression more than 4% (measurement to be made on cold brick after test).

(*b*) In the case of aluminous material the softening point[1] should not be less than that of cone 31 and pieces cut (or moulded) to form standard 9-inch brick on being heated to 1400°C (2555°F) in 4 hours and held at that temperature for 5 hours, shall not expand more than 1%, nor con-

[1] U. S. Bureau of Standards, *Tech. Paper* **7**, also see method of No. 1 below.

tract more than 1.5% linear. Not many people keep their thermocouples accurately calibrated, hence in lieu of the above test we suggest that cone 15 be brought down in 4 hours and that this temperature be maintained for 5 hours by means of a thermocouple which will indicate the progress of the test furnace but which need not be calibrated to indicate the true temperature.

In the case of siliceous brick the softening point may be as low as cone 28, provided the compression in the load test, as described above, is less than 3%.

(*c*) Bars 3 x $1^1/_2$ x 12″ made of the raw refractory batch and fired in a commercial kiln with refractory blocks, when supported on knife edges (10-inch span) loaded at the center (M = 10 pounds per square inch) and heated in a test kiln to cone 15 (cone 15 in 6 hours and held at this temperature one and one-half hours) shall not sag on the under side more than $^1/_2$ inch below the knife edges.

Class B: Clay Refractories which are not directly exposed to fire or glass attack (such as materials used in backing up).

(*d*) These clay refractories should have softening points between cones 26 and 31. The limits shall be the same as for first grade refractories above when a standard 9-inch brick sized piece is heated to 1270°C (cone 12) in 4 hours and held at that temperature for 5 hours.

In lieu of a calibrated thermocouple we suggest that cone 12 be brought down in 4 hours and that this temperature be maintained for 5 hours.

(*e*) Dimensions of all materials in A and B must not vary more than $^3/_{16}$-inch per foot from specified dimensions. Bricks and blocks in both classes must be reasonably well made and correspondingly free from drying and burning defects, such as cracking, warpage and improper oxidation.

Silica Refractories.—(*a*) Silica brick and tile should have a good ring.

(*b*) In order to insure satisfactory quartz, cristobalite, tridymite relations, the specific gravity[1] should not be over 2.38 for brick made from Medina quartzite, nor more than 2.42 for brick made from Baraboo quartzite.

(*c*) The effective modulus[2] of rupture of standard 9-inch brick, set on edge on knife (6-inch span) should not be less than 500 pounds per square inch.

(*d*) The softening point[3] shall not be less than that of cone 31.

3. Flux Blocks.—(*a*) The softening point[1] determined on cones made from a ground sample (60-mesh) of the block, shall not be less than that of cone 29.

(*b*) The porosity[4] of tank blocks shall not be over 25%.

[1] See method 2 below.
[2] See method 3 below.
[3] See method 1 below.
[4] See method 4 below.

(*c*) Crucibles made of the raw flux block mixture, in a mould as per the accompanying sketch, fired in a commercial kiln with flux blocks (or optical to cone 12 in a test furnace in 6 hours and held one and one-half hours) and subjected to a three day fluxing test at the temperature and with the glass (cullet) against which the blocks are to be used, shall show but little attack. The amount of attack can be observed either by cooling the crucible with the glass in it and splitting the crucible vertically through its center, or by pouring the hot glass and inverting the crucible in the furnace for a few minutes to drain. It can then be studied without being broken.

(*d*) The porosity of $2^1/_2$-inch cubes cut from fired blocks and reheated in a test kiln (1400°C in 6 hours (2555°F) and held at that temperature for one and a half hours) shall not have a porosity greater than 22%, nor less than 12%. The volume change determined by suspended weight method[1] shall not exceed 6%, nor be more than 1% expansion. In lieu of a standardized thermo element, we suggest cone 15 in 6 hours and that this temperature be maintained for 1.5 hours.

(*e*) The requirements for dimensions, etc., shall be the same as for 1 (*e*). Rectangular blocks shall be truly so and not merely have opposite sides parallel.

4. **Glass Melting Pots.**—(*a*) The softening point[2] determined from cones made of the raw pot mix, when ground to pass a 65-mesh sieve, shall not be less than that of cone 30, and the softening point of any individual plastic clay constituents of the mix, similarly treated shall not be less than that of cone 29.

(*b*) Bars 1 x 1 x 7″ made from raw pot body, and fired in a test furnace to cone 15 (cone 15 in 6 hours and held at this temperature for 1.5 hours) when supported on knife edges (5-inch span) loaded at the center (M = 7 pounds per square inch) and reheated in a test furnace to cone 15 the same as they were the first time, shall not sag (measured on the under side) more than one-half inch below the knife edges.

(*c*) The total shrinkage[3] of the pot mix from the wet raw state (consistency of side clay) to the condition after being fired to cone 14 in a test furnace (cone 14) in 6 hours and held at this temperature (1.5) hours shall not be over 24% (approximately) by volume (3% linear) based on per cent of wet size. The shrinkage between cone 4 and 14 (determined on pieces previously burned to cone 4), when heated same as above, shall not be more than 3.9% (approximately) by volume (1.3% linear). These figures are based on a drying shrinkage of 15% (approximately) by volume (5% linear) and a burning shrinkage to cone 4 of 5.1% (approximately) by volume (1.7% linear).

[1] See method 5 below.

[2] See method 1 below.

[3] See method 5 below.

(*d*) Bars 1 x 1 x 7″ made of the raw pot mix, when dried and broken according to the tentative method of the AMERICAN CERAMIC SOCIETY[1] shall not show a modulus of rupture less than 225 pounds per square inch.

Any material failing in any one test shall be discarded as unsatisfactory.

Methods of Procedure

1. **Softening Point.**—The sample shall be ground to pass through a 65-mesh Tyler Standard Screen (0.208 mm.) mixed with water and molded into cones similar to Seger-Orton pyrometric cones (tetrahedra, 7 mm. along an edge of the base and 30 mm. high). If the sample be non-plastic, a little organic glue may be added, so that the cones will hold together when dry. The cones shall be set in a straight line in a plaque. A dried cone of the sample shall be set in the plaque with not more than 2 Orton cones on each side of it. Thus none of the standard cones need be more than $^3/_4$ inches away from the material being tested. The heating shall be done in a gas-fired or other furnace in which the atmosphere is maintained nearly neutral (not strongly reducing). The total period of heating shall not be over 2 hours. The rate of heating, near the softening point of the material, should not be greater than that required to cause the bending of one standard cone in 3 minutes.

2. **Specific Gravity of Silica Brick.**—$2^1/_2$-inch cubes of the dried material are weighed, saturated with water and weighed wet, then weighed suspended in water. In terms of grams and cubic centimeters the specific gravity $= \dfrac{D}{(W-S)-(W-D)}$ where D = dry weight, W = wet weight (saturated weight) and S = suspended weight.

3. **Effective Modulus of Rupture.**—The effective modulus of rupture is obtained by subtracting the average deviation from the mean modulus of rupture. The average for this figure shall be made from data on not less than six bricks. The modulus of rupture is calculated by means of the following formula: $R = \dfrac{3WL}{2bd^2}$, where R equals modulus of rupture, L equals distance between supports in inches, b equals breadth of specimen in inches, d equals depth of specimen in inches, and W equals load in pounds at which failure occurs. The mean modulus is merely the arithmetical mean of these figures, and for the effective modulus we have: Effective R = mean $R = \sqrt{\dfrac{S}{N-1}}$, where S equals the sum of the squares of the differences between the various observations and the mean modulus, and N equals the number of observations.

[1] Report of Committee on Standards, Jan. 3, 1918, pages 40–43.

4. Porosity of Burned Clay Products.—$2^1/_2$-inch cubes of the dry material are weighed, saturated with water and weighed wet, then weighed suspended in water. Then, in terms of grams and cubic centimeters, the porosity (ratio of the volume of the open pores to the exterior volume of the piece) $= \frac{W-D}{W-S}$, where D = dry weight, W = wet weight (saturated weight), and S = suspended weight.

5. Volume Change by Suspended Weight Method.—$2^1/_2$-inch cubes of the material are saturated with water and weighed wet, then weighed suspended in water, after which they are dried and reheated. Saturated and suspended weights of the reheated pieces are taken. The volume change $= 1 - \frac{W_2S_2}{W_1S_1}$, where W_1 = wet weight (saturated weight) before reheating, S_1 = suspended before reheating. W_2 = wet weight (saturated weight) after reheating and S_2 = suspended weight after reheating.

If it is desired to measure the change in volume from the raw to the fired state, the pieces may be run in oil both before and after firing. Or if run in water after firing, the readings in oil must be converted to a water basis by dividing by the specific gravity of the oil as: $\frac{W_1-S_1}{\text{sp. gr. of oil}}$.

Addendum

As soon as possible data should be obtained for a heating schedule to be used in heating glass melting tanks. At present we can only suggest the following:

In days 1–75°C (167°F); 2–120°C (248°F); 3–234°C (450°F); then 94°C (200°F) per day to 1250°C (2300°F). In heating window glass tank blocks for hot repairs the same schedule is suggested to 900°C (1657°F), then hold for 36 hours.

The present specifications as far as pots are concerned deal only with the constituents from which the pots are made. It is hoped however that we may soon be able to outline a standard method of handling pots by the consumer, and of their preparation for the furnace.

At present we can only suggest that pots, tank blocks, refractories, etc., stored by consumers, be kept above 90°F (32°C) at all times.

With pots which have been stored as above, the following heating schedule is suggested.

In days 1–75°C (167°F); 2–120°C (248°F); 3–371°C (700°F); 4–596°C (1110°F); 5–816°C (1500°F); 6–1025°C (1880°F); 7–1160°C (2120°F); (check with cone 4 flat under center of bottom) 1 hold 30 hours.

The pot arch should be cooled to 32°C (90°F) before pots are placed in it. If a pot arch is cold it should be dried out by heating to redness

and then cooling to 32°C (90°F) before pots are placed in it. Where pots are to be set directly in a pot furnace at time of starting up, the furnace should first be dried out by heating to bright redness and then cooled to 32°C (90°F) before the pots are placed in it.

It is essential that the pot arches be constructed so that the bottoms of the pots will be as thoroughly heated as the crowns. Pot arches of the down draft type, with exit flues directly under the center of the pot, largely aid in obtaining this uniformity of heating throughout the pot. In easily applied check on the uniformity of heating in the pot arch is to place one pot of cones under the center of the bottom of the pot, and a similar set on top of the crown, cones 01 to 5 inclusive usually serve for this purpose. It may even be desirable to go much higher than above suggested.

It is desired to establish as soon as possible, a fluxing test for pot clay, of the same general nature as that given for flux clay.

DONALD W. ROSS, *Chairman*
GEORGE A. LOOMIS
ARTHUR F. GORTON
C. W. BERRY

MR. HOSTETTER:—You have heard these recommendations and comments of our Committee. It seems to me we may well discuss them, not in their entirety, but separately. We could possibly take the items, "Glass Melting Pots," "Flux Blocks and Clay Refractory Blocks and Bricks and "Silica Refractories." The Committee speaks of cone 27. I have asked the different men what it meant. The answers varied 1670°C, 1620°C, and 1650°C. Cone 27 means something to some of the members but the temperature in Fahrenheit would mean more to the rest of us.

DOCTOR WASHBURN:—A paper is to be presented on this subject by Mr. Sieurin.[1] It gives some very interesting results which seem to point in the near future to being able to replace fusion point specifications and load specifications by chemical composition specifications and porosity.

MR. GRAFTON:—I am sure the clay pot and tank block manufacturers wish to coöperate in every way with the Glass Division in arriving at the standardization of these products, but we do not think it is advisable to adopt any particular standard until the matter is more fully considered.

This test calls for a fusion test of cone 27 to 28, and a softening point between cone 29 and 30, which is 3000°F. That is a pretty high test for some of our clays. Some of the clays we use will not stand that test.

The Gross-Almerode clay would not stand at cone 26. The glass manufacturer is demanding that his product be made from German clay. If these specifications are adopted, it would practically eliminate the use of German clay in our product. We are all trying to find a batch that will

[1] Sieurin and Carlsson, "Resistance Tests on Fire Bricks under Loads at High Temperatures," *Jour. Amer. Ceram. Soc.*, **5**, 170 (1922).

give longer life to the tanks and pots and while some may feel that our domestic clay is superior to the German clay, a great many believe that the German clay is better.

The clay pot manufacturers have recently appointed a committee on this subject, and they would be willing to ask that committee to act in connection with a committee of the Glass Division. The two parties could consult with Committee C-8 of the A.S.T.M.

I move that we adopt that part of the report of the Committee which states that in view of the limited data available our Committee considers it inadvisable to propose a large number of tentative specifications for glass house refractories until the question has been given a more practical study. I also move that a committee be appointed from this Division to consult and confer with the Committee C-8 of the A.S.T.M.

Mr. Brown:—Mr. Chairman, I second that motion.

Mr. Hostetter:—You have heard the motion and it has been seconded. Dr. Silverman states "If our recommendations are approved by the Glass Division, we suggest that they be submitted to the General Committee on Standards of the American Ceramic Society for their consideration and for final approval by the Society at large." This is one of the duties of the Committee of the American Ceramic Society to confer with the Committee of the A.S.T.M.

Mr. Ross:—Some time ago, when this matter first came up, arrangements for a conference with the A.S.T.M. were started, but it has not been held, as I understand the A.S.T.M. Committee has not yet been assembled.

Mr. Brown:—When that Committee, of which I am a member, was appointed a year ago, I wrote to Doctor Silverman, that some of us knew absolutely nothing of specific facts about glass house refractories. On the other hand, we had men who were experts who did not have data available on matters such as lime. The same Committee had to handle both specifications, and in my case I could do nothing in the question of refractories. Lime and other glass house raw material should be considered by a separate committee. We have in our factory several grades, in which, used by another company, the specifications set by Mr. Williams made it questionable. This Refractory Committee has done good work, but I think the motion as made and seconded is right and the matter should be further considered.

Doctor Webb:—Mr. Grafton has told us one possible effect which the adoption of one of these specifications might mean to the manufacturer. Would it not be well, by means of a questionnaire to find out how all of them would be affected should it be adopted, and have that available for the Committee?

Mr. Grafton:—A communication was received from Secretary Purdy.

It was requested that the clay pot and clay manufacturers appoint a committee to work in connection with Dr. Silverman's committee.

Mr. Hostetter:—These specifications, as proposed, are not entirely satisfactory, even as tentative specifications, but personally I should like to see the Committee working on one subject, reduced to a minimum. Now, whether the report should be referred back to the Committee on Standards, expressing the sentiment that we didn't consider the job as having been fairly done and suggesting a questionnaire to the glass house refractory men, or whether we should appoint an additional committee is the point I have in mind.

Mr. Ross:—There is a Standards Committee in our Division, and that Committee will have this matter in charge as far as the Glass Division, the membership of which is appointed each year for one year of service, is concerned.

Mr. Brown:—The matter has been pretty well discussed and three members of the Committee are here; the first part of the report is in two parts (1) refractories and (2) lime specifications. Mr. Grafton has made a motion which has been accepted not to accept the report as turned in, but only part of it. If that is put to a vote, we can dispose of that and then go to the lime which will be accepted probably, and then the committee can be discharged and you can appoint a new committee, one to handle refractories and the one raw materials.

(The motion was carried.)

DISCUSSION ON "ELIMINATION OF STREAKS IN WHITE OPAQUE GLASS"

Mr. Hostetter, Chairman:—When I read this title I wondered whether the gentleman who proposed it has in mind glass that is to be (1) blown or (2) cast and rolled, or (3) pressed in small units. Certainly the three types of working require substantially three different types of glass.

Mr. Payne:—Dealing with the third type, you can eliminate streaks by using a substitute of small articles to be pressed. We probably have made as much opaque ware as anybody in the country. I cannot tell you how to eliminate streaks, but I can tell you of the things that cause them. We run ordinarily 250°F in our opal vats, and 50° excess heat will cause a tremendous number of streaks. We get some with flint glass mixed in. It is more or less transparent and shows dark, and there may be some gas or crystal that will cause it as well. It can easily be done when we make a shift from natural gas to oil, or the other way round.

ACTIVITIES OF THE SOCIETIES

BREAKING INTO THE MOVIES

The sporty editor of the BULLETIN always tries to be seasonable........

This month while the wind blue chill the members of the SOCIETY have been practicing that popular pastime known as ski-jumping. Fifty-five, donning their moccasins and earmuffs (over their custom-mades), entered into this blood-warming exercise, and may now be seen at any movie on Tuesday or Saturday nights. Those with long legs have a natural advantage of course, but this should not be allowed to discount the work of Charles A. Smith, of Columbus, who made leap after leap until he lep clear off the end of the slide and the tape of the judges gave out entirely. He ended at least thirty feet in advance of his nearest competitor, R. R. Danielson of Ellwood City, Pa., who is hardly in the long-legged class but nevertheless was thirty feet ahead of the next man. D. F. Albery, of Chicago, and Alexander Silverman, of Pittsburgh, tied for third place.

Ira E. Sproat, the tallest man in captivity (at least we think he's married), after three classic leaps, did a tail spin that brought home the real bacon in the form of a Corporation Member. Four charter members threw their dignity over the fence and showed the youngsters where to head in, by doing similar stunts, each bringing in a Corporation Member. These were F. W. Walker, S. Geijsbeek, Edward Orton, Jr., and H. C. Mueller. E. C. Sullivan, V. A. Giesey, H. F. Kleinfeldt, and W. H. Herbert followed suit. The score card follows:

	Personal	Corporation		Personal	Corporation
Charles A. Smith	11		J. W. Cruikshank	1	
R. R. Danielson	8		R. V. Widemann	1	
D. F. Albery	5		W. E. Dornbach	1	
Alexander Silverman	5		F. H. Auld	1	
Ira E. Sproat	3	1	A. V. Bleininger	1	
R. K. Hursh	3		Miss Mary G. Sheerer	1	
P. H. Swalm	2		Miss Mabel C. Farren	1	
R. F. Segsworth	2		C. H. Modes	1	
E. W. Tillotson	2		Joseph A. Martz	1	
A. Malinovzsky	2		E. H. Fritz	1	
T. W. Garve	2		D. A. Moulton	1	
F. W. Walker		1	E. A. Brockman	1	
S. Geijsbeek		1	F. C. Flint	1	
Edward Orton, Jr.		1	K. N. Endell	1	
H. C. Mueller		1	A. E. Williams	1	
E. C. Sullivan		1	F. K. Pence	1	
V. A. Giesey		1	D. M. Thorpe	1	
W. H. Herbert		1	Chas. A. Nicely	1	
H. F. Kleinfeldt		1	Leon J. Frost	1	
H. S. Langworthy	1	1	Charles F. Geiger	1	
A. O. Austin	1		Leslie Brown	1	
C. F. Binns	1		Wm. Cannan, Jr.	1	
F. H. Rhead	1		J. S. McDowell	1	
G. Percy Cole	1		W. M. Jacobs	1	
P. H. Walker	1		Charles G. Lippert	1	
C. E. Bales	1		Edmund Brown	1	
W. F. Wenning	1		A. Weber, Jr.	1	
R. E. Griffith	1		Office	29	

Total 110 Personal, 10 Corporation

H. S. Langworthy made a clever jump and swung around the circle with a Corporation Member hanging to his coonskin cap. R. K. Hursh made three jumps of great brilliance, while P. H. Swalm, R. F. Segsworth, E. W. Tillotson, A. Malinovzsky and T. W. Garve each made two. Of course it was comparatively easy for a Canadian but how they do it in California is something for Mr. Einstein to explain. Thirty "alsoentereds," among them two of our better halves, did themselves and the Society credit without receiving a D. S. O. for it.

What really makes this ski-meet a gala occasion is that the total jumps of all the participants put the SOCIETY ahead of where it was at last reports by one hundred and twenty members. The dizzy total now is 1918. Don't be mistaken. This is not a year, nor a time for the 220; it is the actual number of members now belonging to the AMERICAN CERAMIC SOCIETY.

NEW MEMBERS RECEIVED FROM JAN. 13, 1923 TO FEB. 10, 1923

ASSOCIATE

Adcock, Albert Scholl, 1999 Iuka Ave., Columbus, Ohio, Student Ceramic Engineering, O. S. U.

Arnold, Russell Ellsworth, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., Ceramic Engineer.

Barnhart, Marion M., 225 W. Ohio Ave., Sebring, O., Gen. Supt. Limoges China Co.

Black, Thompson Wm., Oshawa, Ontario, Mgr. Ontario Potteries Co., Ltd.

Boyd, Robert C., Sigma Nu House, Ames, Iowa, Student.

Buck, L. M., Fort Ave. & Lawrence St., Baltimore, Md., Treas. The Buck Glass Co.,

Burket, Chester C., 1288 Nicholson Ave., Lakewood, Ohio, Secy. Cleveland Feldspar Co.

Burkhalter, Edward, 80 Thirteenth Ave., Columbus Ohio, Student.

Butman, Leo T., F. R. Muller & Co., Waukegan, Ill., Production & Factory Mgr.

Canfield, Ruth Ella, Instructor of Ceramics and Weaving, Carnegie Inst. of Technology, Pittsburgh, Pa.

Christman, H. M., 30 E. Frambes Ave., Columbus, Ohio, Student.

Cook, Herman L., 406 E. Healey St., Champaign, Ill., Student, Univ. of Illinois.

Cummings, John W., Box 16, Bath, Maine, Pres. & Treas. Mining & Grinding Feldspar.

DeVol, Arthur B., 34 Eighteenth Ave., Columbus, Ohio, Student.

DeVol, James Coleman, A-B Stove Co., Battle Creek, Mich., Supt. Enameling Division.

Dodge, Alfred W., Y. M. C. A., Zanesville, Ohio, Chemist, Kearns-Gorsuch Bottle Co.

Dorfner, Josef, Doktor Ingenieur, Meiningen y Thüringen (Deutschland) Direktor der Forschungs-Gesellschaft vereinigter Porzellanfabriken m.b.h.

Dunkin, Damon Duffield, Guion, Arkansas, Pres. & Gen. Mgr., Silica Products Co.

Dunwody, William Elliott, 460 Broadway, Macon, Georgia, Pres. Standard Brick Co.

Emmert, Edward, Des Moines, Iowa, Dist. Sales Manager, Walsh Fire Clay Products Co.

Gordon, Donald Dean, Wallaceburg, Ont., Mgr. Dominion Glass Co., Ltd., Wallaceburg Factory.

Gosnell, Jack, Washington Iron Works, Los Angeles, Calif., Charge of Mixing Room.

Gould, Robert E., 1927 Waldeck Ave., Columbus, Ohio, Student.

Hagar, I. D., 94 Fulton St., New York City, Buckman & Pritchard, Inc.

Hemsteger, Samuel E., 91 Sixteenth Ave., Columbus, Ohio, Student.

Higgins, Ray, 431 High St., Wadsworth, Ohio, Electrical Eng. Ohio Insulator Co., Barberton, Ohio.

Hobson, Mrs. George H., 126 High Street, Brookline, Mass.

Hottinger, Arnold H., 2525 Clybourn Ave., Chicago, Ill., Laboratory, Northwestern Terra Cotta Co.

Hughes, Walter M., 137 West 10th Ave., Columbus, Ohio, Student.

Jones, Edgar, 35 Rimbach Ave., Hammond, Ind.

Kautz, Karl M., 30 E. 8th Ave., Columbus, Ohio., Student in Ceramic Engineering O. S. U.

Kelsey, Victor V., 1026 Luttrell St., Knoxville, Tenn., Secy. Knox Porcelain Co.

King, John A., Box 744, Worcester, Mass., Refractory Salesman, Carborundum, Co., Perth Amboy, N. J.

Koch, Edward, 655 Underhill St., Louisville, Ky., Standard Sanitary Mfg. Co.

Lampert, Walter G., 108 E. McComb St., Belvidere, Ill., Supt Hercules Porcelain Co.

Leary, Earl F., 907 E. 75th St., Chicago, Ill., President, Pyrometer Engineering.

Leary, William H., 907 E. 75th St., Sec. & Treas., Pyrometer Engineering.

Lenchner, Theo., 720 Bessemer Bldg., Pittsburgh, Pa., Mgr. Vitrifiable Color Dept., Vitro Manufacturing Co.

Massey, Crawford, 98 Fourteenth Ave., Columbus, Ohio, Student.

Ochs, Arthur C., Springfield, Minnesota, A. C. Ochs Brick & Tile Co.

Pigott, Howard W., 5043 Walnut St., Philadelphia, Pa., Salesman, E. J. Lavino & Co.

Preston, Harold Herbert, East Liberty Y. M. C. A., Pittsburgh, Pa., J. W. Cruikshank Eng. Co.

Riviere, Georges, 98 Boulevard de Courcelles, Paris, Administrateur-Directeur de la Cie Gle de Construction de Fours.

Roy, Charles Smart, St. Helens, Forest View, Chingford, London, E. A., England, Chemical Technologist.

Smart, Richard Addison, 114 Colorado Ave., Detroit, Mich., Detroit Rep. American Refractories Co.

Totten, George Oakley, Jr., 808 Seventeenth St., Washington, D. C., Architect & Porcelain Manufacturer.

Watrous, Aida, Box 23, Groton, Conn., Instructor at Norwich Art School.

Weeden, Chas. H., Rear 1295 N. 4th St., Columbus, Ohio, Enamel Mfg.

Wehtje, Ernst, Bromölla, Sweden, Managing Director, Aktiebolaget Ifö Chamotte-Kaolinverk.

Wells, A. A., Newell, W. Va., Asst. Chemist, Research Dept., Homer-Laughlin China Co.

Westfeldt, Martha G., P. O. Box 5161 Station B., New Orleans, La.

Williams, Frederick H., 1927 Elmwood Ave., Buffalo, N. Y., Treas. and Gen. Mgr., Buffalo Porcelain Enameling Corp.

Williams, William George, 429 N. Lawler Ave., Chicago, Ill., Foreman, Enameling-mixing Dept., Coonley Mfg. Co., Cicero, Ill.

Wishnew, Alex., Y. M. C. A., Wheeling, W. Va., Ceramist, Wheeling Tile Co.

Wolfram, Harold George, 501 E. Daniel St., Champaign, Ill., Student, Univ. of Ill.

Zoller, Miles M., 208 So. LaSalle St., Chicago, Ill., Eagle Picher Lead Co.

Corporation

Abbé Engineering Co., Henry F. Kleinfeldt, Secy., 50 Church St., New York City.

Corning Glass Works, E. C. Sullivan, Corning, N. Y.

The Portsmouth Refractories Co., W. B. Hitchcock, Portsmouth, Ohio.

R. T. Vanderbilt Co., R. T. Vanderbilt, Pres., 50 East 42nd St., New York.

MEMBERS RECEIVED DURING PITTSBURGH CONVENTION

ASSOCIATE MEMBERS

Bacharach, Herman, 7000 Bennett St., Pittsburgh, Pa., Pres. Bacharach Ind. Instrument Co.

Baldauf, Earl E., 60 East Lane Ave., Columbus, Ohio.

Beckert, Carl J., 1842 Indianola Ave., Columbus, Ohio, D. A. Ebinger San. Mfg. Co.

Blom, O. W., Ethunac, Calif., Mine Supt.

Boeschenstein, Harold, Alton, Illinois, Secy.-Treas. & Mgr. Duval d'Adrian Chemical Co.

Bouton, Geo. I., 2926 Baldwin Ave., Detroit, Mich., Chief Eng. Murphy Furnace Co.

Brenner, R. F., Chemist, H. C. Fry Glass Co., Rochester, Pa.

Burgess, Wm., 30 Logan Ave., Todmorden, Ont.

Burlingame, Robert C., 614 Henry Ave., Wellsville, Ohio. McLain Fire Brick Co.

Cunningham, H. S., 3832 Eoff Street, Wheeling, W. Va.

Dalzell, W. F., 1204 Seventh St., Moundsville, W. Va., Chief Chemist, Fostoria Glass Co.

Denison, Geo. W., Cleveland, Ohio.

DeVaughn, Harry E., Morgantown, W. Va., Chief Engr., U. S. Window Glass Co.

Doyle, William Thomas, 128 North Wells St., Chicago, Ill. Pres. Terra Cotta Service Bureau.

Endler, A. H., 365 1/2 W. Indiana Ave., Sebring, O. Supt. Strong Mfg. Co.

Everitt, F. C., 620 Riverside Ave., Trenton, N. J., Supervising Engr. Miller Franklin Basset & Co., 347 Madison Ave., New York City.

Fesler, Raymond T., 1943 Waldeck Ave., Columbus, Ohio.

Glenner, Francis R., 91 Chambers St., New York City, Mgr. Eastern Chem. Div. Lindsay Light Co.

Grainer, Russel J., 211 Mill St., Beaver Dam, Wis. Vitro Enameler, Malleable Iron Range Co., Beaver Dam, Wis.

Hardy, Wm. T., 285 South Water St., Milwaukee, Wis. Gen. Mgr. Luther Grinder Mfg. Co.

Hemphill, R. W., Colonial Insulator Co., Akron, Ohio.

Hitchins, Park, 1447 Oliver Bldg., Pittsburgh, Pa., Sales Representative United States Refractories Corp.

Hobert, Leroy F., Sandusky, Ohio, Secy.-Treas. The Universal Clay Products Co.

Hodek, F. E., Jr., 4101 Parker Ave., Chicago, Ill., General Porcelain Enameling & Mfg. Co.

Humpel, Frank, 1200 Fulton St., Grand Haven, Mich., Challenge Refrigerator Co.

Humphrey, A. F., Greensburg, Pa., Mgr. Keystone Clay Products Co.

Isherwood, John J., 6634 Northumberland St., Pittsburgh, Pa., Sales Rep., Eureka Fire Brick Co.

Jones, Emery Williamson, 1262 Ontario St., Cleveland, Ohio., Refractory Div. The Carborundum Co., Perth Amboy, N. J.

Lake, Charles C., Alfred, N. Y., Student, New York School of Ceramics.

Lano, C. A., Goldsboro, N. C., Gen. Supt., Borden Brick & Tile Co.

Lees, Arch. A., 1110 Franklin Ave., Wilkinsburg, Pa., Refractory Dept., Carborundum Co.

Lovett, C. H., Cook Pottery Co., Trenton, N. J., Secy., Cook Pottery Co.

Mackasek, Edward, Beaver Enameling Co., Ellwood City, Pa.

May, A. Largne, Secy.-Treas., Beaver Enameling Co., Ellwood City, Pa.

Mayer, C. P., Bridgeville, Pa., Pres., C. P. Mayer Brick Co.

Nicely, C. A., Watsontown, Pa., Supt., Watsontown Brick Co.

O'Hara, C. H., P. O. Box 776, East Liverpool, Ohio, Salesman, Roessler & Hasslacher Chemical Co.

Oldt, Guy H., Paxtonville, Pa., Supt., Paxton Brick Co.

Olsen, Rangwald Severn, 501 E. Daniel Street, Champaign, Ill.

Parker, Chas. W., 6830 Waterman Ave., St. Louis, Mo., Mgr., Walsh Fire Clay Products Co., St. Louis.

Parmelee, Clifford H., 430 Center St., Solvay, N. Y., Onondaga Pottery Co., Syracuse, N. Y.

Polk, Robert E., 435 Sixth Ave., Pittsburgh, Pa., Chief Industrial Engineer Gas & Elec. Public Utility.

Reed, Carl E., Lancaster, Ohio.

Robinson, W. M., Bolivar, Pa., Pres., Garfield Fire Clay Co.

Schott, Dr. Erich, Jenaer Glaswerk Schott & Gen., Jena, Germany.

Sharp, Edward, 4216 Hirsh St., Chicago, Ill., Edison Elec. Appl. Co.

Showers, Lee, Pittsburgh Plate Glass Co., Pittsburgh, Pa., Supt.

Smith, Louis A., Jones Laughlin Steel Corp., Aliquippa Works, Woodlawn, Pa., Supt. Coke Oven Dept.

Stewart, Mrs. Wm. Alvah, Thistlegate Farm, Coraopolis, Pa.

Swain, Roy E., Box 666, Charleroi, Pa., Engineering Dept., Macbeth-Evans Glass Co.

Trathowen, T., Chemist, B. F. Drakenfeld & Co., Washington, Pa.

Walrath, L. D., 1155 Main Street, Buffalo, N. Y., Mgr. Acme Shale Brick Co.

Walsh, N. S. Chouteau, 220 Fifth Ave., New York City, Treas., Walsh Fire Clay Products Co.

Worth, Geo. E., Rochester, N. Y., Manager, Genesee Feldspar Co., Inc.

CORPORATION

Straitsville Impervious Brick Co., New Straitsville, Ohio., John D. Martin, Mgr.

Associated Tile Manufacturers, Beaver Falls, Pa., F. W. Walker, Secretary.

Geijsbeek Engineering Co., Burke Bldg., Seattle, Wash., S. Geijsbeek, Pres.

Jewettville Clay Products Co., Inc., Jewettville, N. Y., H. S. Langworthy, Vice-Pres.

Mueller Mosaic Co., Trenton, N. J., H. C. Mueller.

Edward Orton, Jr., 1738 N. High St., Columbus, Ohio.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

P. S. Bachman, formerly of 92 W. Maynard Ave., Columbus, Ohio, is now located at 563 Market St., Wooster, Ohio.

C. E. Bales, Chemist of the Louisville Fire Brick Works, was recently elected President of the Louisville Section of the American Chemical Society.

Richard B. Carothers, Assistant Manager of the H. C. Spinks Clay Co., has moved to Puryear, Tenn., from Newport, Ky.

Conrad Dressler of the American Dressler Tunnel Kilns, Inc., has changed his address from 1740 East 12th St. to The Studio, 10915 Cedar Avenue, Cleveland, Ohio.

R. F. Ewing, formerly with the McLain Fire Brick Co. at Wellsville, Ohio, is now associated with the Globe Brick Co., E. Liverpool, Ohio.

Gerald Fitz-Gerald of Birmingham, England, informs us that he has accepted a position with the Maxon Furnace & Engineering Co., located at Muncie, Ind.

F. P. Hall with the U. S. Bureau of Standards, Washington, D. C., has moved from 630 Webster Ave. to 4717 Wisconsin Ave.

Max Meissner advises a change of address from Hoopeston, Ill., to 15200 Loomis Ave., Harvey, Ill.

Ichijo Mokiji of 165 Broadway, New York City, is now in Germany, care of the Japanese Consulate General.

Joseph K. Moore of 122 Waverly Place, New York City, announces his new location at Room 2602, 120 Broadway.

C. Nick Muessig, salesman for the B. F. Drakenfeld Co., Inc., has deserted his E. Liverpool, Ohio, address for 50 Murray St., New York, N. Y.

Henry Oesterle of Canandaigua, N. Y., is now connected with the Roesch Enamel Range Co., at Belleville, Ill.

George J. Openhym, a former student at the N. Y. State School of Clayworking & Ceramics, wishes to be addressed at 16 Woodland Place, White Plains, N. Y.

James G. Phillips of Piqua, Ohio, has recently moved to 116 S. Broadway, Middletown, Ohio.

David A. Raiff, Coshocton, Ohio, wants his mail addressed to 138 Park Ave.

Wallace C. Riddell has changed his address from Le Roy Avenue, Berkeley, Calif., to 2544 Buena Vista Way.

Oscar Scherer has moved from Columbus, Ohio, to 530 Oakdale Ave., Chicago, Ill.

Ramsay Skinner, Treas. of the Reeves and Skinner Mach. Co., St. Louis, Mo., notifies us of a change of address from 4471 Olive St., to 3458 Sidney St.

R. T. Stull recently of the Columbus Station, U. S. Bureau of Mines, is now located in Savannah, Ga., as Assistant Industrial Agent of the Central of Georgia Railroad Co.

B. T. Sweely has discontinued his services with the Cribben & Sexton Co. of Chicago, and is now associated with the Baltimore Enamel & Novelty Co., Box 34, Baltimore, Md.

R. S. Webb of the American Window Glass Co. at Belle Vernon, Pa., wishes to be addressed at Larimer P. O., Larimer, Pa.

OBITUARY

Lysle R. Kraus, Secretary of the Kraus Research Laboratories, Inc., died Tuesday, Feb. 6th, 1923 as the result of a railroad accident.

Mr. Kraus was born Nov. 21, 1893 at Cockeysville, Md., was graduated from Sparks Agricultural College in 1914, and was one of the founders of the Kraus Research Laboratories, Inc., and associated himself with the company in the capacity of Ceramic Engineer.

In the ceramic field, Mr. Kraus invented several processes for the plasticizing of clays and developed many bonding clays of exceptional values. His research work in refractories was very exhaustive—making many improvements over present day methods and producing several new refractory bases.

Mr. Kraus' sudden death will be felt as a severe loss in the ceramic field.

NOTES AND NEWS

PROBLEMS IN THE DETERMINATION OF PHYSICAL PROPERTIES

Research Problems for Theses

In preparing for publication the data on physical properties of chemical substances, the editorial staff of International Critical Tables will find from time to time that important physical properties of substances of technical and scientific importance are missing from the literature. As fast as we become aware of missing data of this character, it is our policy to formulate research problems covering such missing data and to endeavor to interest chemists and physicists in undertaking the necessary investigations to supply the required data.

Most of the research problems formulated in this way will be suitable for bachelors' or masters' theses and in a few instances topics sufficiently broad to be suitable for doctors' theses will also be available. Many of them will be suitable for experimental problems in the ordinary laboratory courses in physical chemistry and physics. Thus, for example, the laboratory experiment covering the determination of solubility might, to advantage, deal with substances whose solubility is needed but is unknown. The average of the determinations made by a class of students, while not as accurate and reliable as the determinations made by a skilled investigator, will nevertheless be very valuable when they constitute the only data available on the subject. Moreover, the average student will be more interested in a laboratory experiment the results of which are of actual value and worthy of publication than he would be in repeating for the nth time the measurement of a property of some system which has been measured many times before.

International Critical Tables will be glad to submit to interested instructors in universities and colleges lists of problems of this character and to advise as far as it can concerning suitable apparatus and methods of measurement. It may be possible also in some instances to secure moderate financial assistance to aid in the purchase of materials and apparatus for investigators interested in carrying out work of this character. The results of such work may be published by the investigator in any appropriate publication medium and they should also be reported in duplicate to the office of International Critical Tables on completion of the work.

A number of problems on the following subjects are available at the present date: Heats of combination; solid oxides; Fe compounds. Specific heats; brass; solid oxides; steels; oils and fats; petroleum products; metals; salts; Fe compounds; asphalts. Latent heats of fusion; brass; metals. Heat conductivity; steels. Latent heats of vaporization; petroleum products. Viscosities; industrial materials; solutions. Kinetics; rates of drying hydrolysis of industrial materials; catalysis; transpiration of moisture; biochemical. Strength; industrial materials. Thermal expansion; steels; Fe compounds. Freezing-point-solubility diagrams; salts; acids; metals in water; soaps. Boiling points; solutions. Solubility of gases; in molten metals; in water. Chemical equilibrium; dissociation pressures at 1600°C. Electrical conductivity; metals, refractories. Properties of colloidal systems; industrial materials. Vapor pressures; metals; solutions. Specific rotatory power; gliadin. Index of refraction; solids. Density; certain organic compounds; solutions. Flash points. Surface tensions; solutions.

International Critical Tables,
1701 Massachusetts Avenue, N. W.,
Washington, D. C.

December 10, 1922

NEW REPORT ON OHIO CLAYS

The Geological Survey of Ohio under the direction of J. A. Bownocker in coöperation with the United States Bureau of Mines, Columbus Station, with R. T. Stull in charge, has a report nearly completed on the coal-formation or buff-burning clays of Ohio. In all 87 samples were tested; 28 from the Pottsville formation; 55 from the Allegheny; 2 from the Conemaugh; and 2 from the Monongahela. The range is from high-grade flint to low-grade plastic clays. The report includes a short history of the progress of the various branches of the ceramic industry as practised in Ohio; geological data regarding the extent and stratigraphy of each bed with a list of the factories using it, the physical properties of each sample by R. T. Stull, the complete chemical analysis of each sample by D. J. Demorest, and a microscopial examination of representative samples of each member by William J. McCaughey. The report will approximate 450 pages.

WILBUR STOUT

BUREAU OF STANDARDS PUBLICATIONS

TECHNOLOGIC PAPERS ON CERAMIC PRODUCTS ISSUED[1] BY BUREAU OF STANDARDS, WASHINGTON, D. C.

A[2]

10. The Melting Point of Fire Brick
31. Some Leadless Boro-silicate Glazes Maturing at about 1100°C
40. The Veritas Firing Rings
50. The Viscosity of Porcelain Bodies High in Feldspar
104. The Effect of Size of Grog in Fire Clay Bodies
105. Comparative Tests of Porcelain Laboratory Ware
111. The Compressive Strength of Large Brick Piers
120. Tests of Hollow Building Tile
124. Constitution and Microstructure of Silica Brick and Changes Involved through Repeated Burnings at High Temperatures
142. Materials and Methods Used in the Manufacture of Enameled Cast Iron Wares
144. Properties of American Bond Clays and their Use in Graphite Crucibles and Glass Pots
155. Cement for Spark Plug Electrodes
159. Porosity and Volume Changes of Clay Fire Bricks at Furnace Temperatures
196. High Fire Porcelain Glazes.

B[3]

7. Testing of Clay Refractories with Special Reference to their Load Carrying Abilities at Furnace Temperatures (15c)
21. The Dehydration of Clays (5c)
22. Effect of Overfiring upon the Structure of Clays (5c)
46. A Study of the Atterberg Plasticity Method (5c)
85. Manufacture and Properties of Sand-Lime Brick (5c)
107. Comparative Tests of Chemical Glassware (10c)
116. Silica Refractories—Factors Affecting their Quality and Methods of Testing the Raw Materials and Finished Ware (20c)
165. Enamels for Sheet Iron and Steel (15c)

[1] Issued April 6, 1922.

[2] Available for distribution by Bureau of Standards.

[3] For sale by Supt. of Documents, Government Printing Office, Washington, D. C. at prices given.

C[1]

1. Effect of Preliminary Heat Treatment upon the Drying of Clays
17. The Function of Time in the Vitrification of Clays
23. Technical Control of the Colloidal Matter of Clays
30. Viscosity of Porcelain Bodies
51. Use of Sodium Salts in the Purification of Clays and in the Casting Process
79. Properties of Some European Plastic Fire Clays
80. Constitution and Microstructure of Porcelain

Scientific Paper No. 212—Melting Point of Some Refractory Oxides.

CALENDAR OF CONVENTIONS

American Association of Flint and Lime Glass Mfrs.—April, 1923.
American Association of Ice & Refrigeration—Washington, D. C., probably March, 1923.
American Dental Trade Association—Spring Lake, N. J., June, 1923.
American Face Brick Association—First Week in December, 1923.
American Face Brick Association, Southern Group—West Baden, Ind., November, 1923.
American Foundrymen's Association—Cleveland, Ohio, April 30–May 3, 1923.
American Gas Association—October, 1923.
American Hotel Association of United States and Canada—San Francisco, April, 1923.
American Society for Testing Materials—Place not determined, June, 1923.
American Zinc Institute—St. Louis, Mo., May 7 and 8, 1923.
Association of Scientific Apparatus Makers of the United States of America—Washington, D. C., April 20, 1923.
Chamber of Commerce of the United States of America—New York City, May 8–10, 1923.
Clay Products Association—Chicago, Ill., Third Tuesday in each month.
Dental Manufacturers' Club of the United States—Spring Lake, N. J., June, 1923.
Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18, 1923.
International Chamber of Commerce—Rome, Italy, Week of March 19, 1923.
Manufacturing Chemists' Association—New York, June, 1923.
National Association of Brass Manufacturers—March, 1923.
National Association of Manufacturers of Pressed and Blown Glassware—Pittsburgh, March 13, 1923.
National Association of Manufacturers of the United States—New York City, Week of May 14, 1923.
National Association of Stove Manufacturers—Richmond, Va., May 9, 1923.
National Association of Window Glass Manufacturers—Place and date not determined.
National Board of Fire Underwriters—New York, May 24, 1923.
National Bottle Manufacturers Association—Atlantic City, N. J., Last of April, 1923.
National Gas Appliance Manufacturers Exchange—Kansas City, Mo., May, 1923.
National Gas Association of America—Louisville, Ky., Spring, 1923.
National Paving Brick Manufacturers' Association, December, 1923.
National Gas Association of America—Louisville, Ky., April 23–24, 1923.
Refractories Manufacturers' Association—March 21, 1923.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Southern Association of Stove Manufacturers—Louisville, Ky., March, 1923(?).
Stoker Manufacturers' Association—May or June, 1923.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

[1] Supply exhausted; can be consulted in libraries, list of which is given in Supplement No. 3 to Circular 24.

March, 1923 **The Journal of the American Ceramic Society** Vol. 6, No. 3

Published monthly by the American Ceramic Society

Publication Offices, 211 Church St., Easton, Pa.

Editorial Office, 230 Lord Hall, Ohio State University, Columbus, Ohio

Advertising Department, 170 Roseville Ave., Newark, N. J.

Entered as second-class matter, July 15, 1918, at the Post Office at Easton, Pa., under the Act of March 3, 1879.
Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized August 16, 1918.

Eight dollars a year. Single numbers, 75 cents.
(Foreign postage 50 cents additional)

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

Vol. 2 April, 1923 No. 4

EDITORIAL

INDIVIDUALISM IN ASSOCIATION ACTIVITIES

Its Responsibilities and Benefits

"American Individualism" by Herbert Hoover, a book of only seventy-two pages, is a wonderfully clean cut and timely message which every American should read. The New York Times says, "This little book deserves to rank, and doubtless will rank, among the few great formulations of American political theory. It bears much the same relation to the problems of the present and the future that the essays of Hamilton, Madison, Jay, and Noah Webster bore to the problems that occupied men's minds when the constitution was framed."

Individualism is the social, the spiritual, the economic and the political principle for which all peoples are striving. It finds a larger expression in American institutions than elsewhere and it is the foundation on which the American Ceramic Society is builded. Mr. Hoover says that the individualism of America

> differs from all others because it embraces these great ideals: that while we build our society upon the attainment of the individual, we shall safeguard to every individual an equality of opportunity to take that position in the community to which his intelligence, character, ability and ambition entitle him; that we keep the social solution free from frozen strata of classes; that we shall stimulate effort of each individual to achievement; that through an enlarging sense of responsibility and understanding we shall assist him to this attainment; while he in turn must stand up to the emery wheel of competition.

This from the pen of Mr. Hoover is the only formula by which the American Ceramic Society or any association, trade, technical, scientific, social, political, or religious, can work out its appointed tasks. The reason for this emphasis on individualism in society affairs is given by Mr. Hoover in the following.

> The economic development of the past fifty years has lifted the general standard of comfort far beyond the dreams of our fore-fathers. The only road to further advance in the standard of living is by greater invention, greater elimination of waste, greater production and better distribution of commodities and services, for by increasing their ratio to our numbers and dividing them justly we each will have more of them.
>
> Today business organization is moving strongly toward coöperation. There are in the coöperative great hopes that we can even gain in individuality, equality of opportunity, and an enlarged field for initiative, and at the same time reduce many of the great wastes of overreckless competition in production and distribution. Coöperation in its current economic sense represents the initiative of self-interest blended with a sense of service, for nobody belongs to a coöperative who is not striving to sell his products or services for more or striving to buy from others for less or striving to make his income more secure. Their members are furnishing the capital for extension of their activities just as effectively as if they did it in corporate form and they are simply transferring the profit principle from joint return to individual return. Their only success lies where they eliminate waste either in production or distribution—and they can do neither if they destroy individual initiative. Indeed this phase of development of our individualism promises to become the dominant note of its 20th Century expansion. But it will thrive only in so far as it can construct leadership and a sense of service, and so long as it preserves the initiative and safeguards the individuality of its members.

Every member of trade and technical associations has the opportunity to profit from the experiences and service of their fellow members through organized collaboration in the solving of problems. If operated at one hundred percent efficiency each member of this Society would profit from the activities of the nineteen hundred and thirty-three other members. The efficiency of this as of every like organization is in direct ratio to the number of individual members who participate; it is dependent upon individual efforts.

No association will be successful unless its management reflects the interest of its members. The degree of this Society's success in rendering service to the ceramic industries is dependent upon the service rendered by the members individually. It is on these fundamental principles that the officers and committeemen of the Society, of the Divisions, and of the Local Sections are working. They are not chosen to do solo parts; they are simply the leaders and agents chosen by the individual members, not as *representatives* in service, but as *leaders* in service.

The success attending the efforts of the officers and committeemen and of the Divisions is proportional to the *active* interest of the individual members. There would be no accumulation of knowledge, no abstracting of the world's literature, no pyramiding of fundamental scientific facts into

industrial practices unless the individual members contribute of their knowledge and time.

There can be no dominance of officers and committeemen in the affairs of a successful society; indeed there is no enduring incentive for one to dominate in a technical society. The guiding incentive of a chosen officer and committeeman should be none other than to render that service which he believes his predecessor and successor in office should render.

The American Ceramic Society has developed to its present strength and ability to serve because it has emphasized and rewarded individual services. It has allowed full scope to the development of individual ambitions and aspirations, providing the ways and means of acquiring knowledge and of gaining recognition. The Society offers equal opportunity to each to earn that position in ceramic circles to which his intelligence, character, ability and ambition entitle him, and the strength and character of the Society in the great service it is rendering is a composite of the character, intelligence, ability and ambition of the individual members in this organized service scheme.

This Society is a group of persons and corporations, each intent on the best welfare of self, who have learned that self is best served when unselfishly serving with others. Individualism in purpose, service and responsibilities is not sacrificed in any degree in the collective service of a group.

It is not the will of the officers but the will of the individual members that shall be done. It is essential, however, that each member realizes that his will can be done only through service. The *Journal* will be what the individual members will it to be. The satisfactory progress made by this Society during the past twenty-five years was due to unselfish services rendered by individuals many of whom sacrificed a great deal of time and energy but each of whom found that he served self best when serving others most, for service of one begets service of many. This principle of self service through service to others is now a precept in association work and those who serve are increasing in numbers and in enthusiasm for service.

We have before this emphasized decentralization of activities. We believe in this thoroughly. No officer can, with justice to the members, substitute for those who selected him as their leader. The American Ceramic Society is growing stronger day by day in service to the ceramic industries because of this decentralization of service responsibilities through Divisions and Committees to the individual members. We believe in individualism in association activities and have learned that benefits accrue to the individual in proportion to the responsibilities he assumes and to the services he renders.

PAPERS AND DISCUSSIONS

RESEARCH—ITS VALUE TO A MANUFACTURING EXECUTIVE[1]

By B. E. Salisbury

In an attempt to discuss this subject, I do not feel that I am going to bring before you anything you do not already know, or that has not before been ably presented, but rather to give you some thoughts that have come to me during the years that I have been interested in the application of research work to some of my own problems.

The last few decades have seen great changes in the manufacturing industry. We are in the era known as big business. Changes of method and management have necessarily occurred. In the history of manufacturing, as well as of other kinds of commercial activity, there has usually been a small beginning on the part of some one man. This man had an idea, possibly much in the nature of a dream or a hope. As time went on and his industry developed he associated with himself other men. There was not in those early days much, if any, organized scientific knowledge. Certain practices, as a result of costly and bitter experiences, came to be recognized as better than others, yet there was little scientific basis for supporting them, and even this was not of general knowledge. In some comparatively few cases such industries were successful and grew to larger proportions, but by far the greater number were failures.

Attracted by the success of these ventures, and not deterred by the failures, others attempted, and in the absence of general organized knowledge, worked in comparative ignorance, and went through these same costly and bitter experiences, some few to succeed, others to fail. So it has been going through all the long years.

As the successful business expanded it became impossible for one man to cope properly with the situation, and so others were gradually trained as helpers, but still there was little definite organized knowledge, and such as existed was carefully guarded by the founder, and those whom he was training. The master still kept his fingers on the situation.

The business continued to develop and expand, and soon came a time when the master could no longer keep in intimate touch with all the operations. There also began to dawn in his mind the fact that, though successful, the business was not on a sure foundation, and that his investment, as well as that of his associates, depended too largely upon his health and continued life. Some way had to be found to carry on after his usefulness came to an end. At the same time he doubtless began to realize the desirability of some definite information of a scientific nature, why certain methods and practices he had worked out were the best, and why others were not desirable; and, still another step, there probably came to

[1] Pittsburgh Meeting, Feb. 12, 1923.

his mind the idea that carefully organized and diligent study and experimentation might reveal methods and practices better than his own.

Being a very busy man, he realized that he could not himself conduct the necessary investigations along these lines without sacrificing time needed in the successful conduct of his enterprise. Consequently he selected some one with qualifications he considered necessary, and, with crude facilities, set him to work at this task. This is my picture of the genesis of the research laboratory.

Business continued to grow, and many of a like nature consolidated. Still the master mind was getting farther away from the details. It being necessary to keep in touch with the operations, the factories were carefully departmentalized, and simple records were started to give him a continuing picture of operations. Cost and efficiency studies were begun. And so today the manufacturing executive keeps in touch with his operations largely through his department heads and his examination of records and statistics. In many of the large industries this is done far away from the scene of operations, which are scattered throughout the country. Considerable time could profitably be consumed in the discussion of the effect of this development on the social structure, but it is not my purpose to go into that subject now.

Today, the progressive industries engaged in manufacturing articles of a nature that are not almost wholly pure fabrication, maintain expensive and well equipped research laboratories, with technically trained men who devote their whole time to investigation of the possibilities of a better product, the study of ways to reduce losses in manufacture, and the search for better and cheaper methods, and also, what is of great importance, the testing of materials, and the product in varying stages of manufacture, so as to make more certain a uniform result. There are some industries in which the producing units are not consolidated under one head, that engage in coöperative research, the extent of which would be beyond the financial ability of any one of the units. In some the technical and research men organize themselves into societies such as our own, and convene to compare notes, and to publish various researches and the conclusions therefrom. This information, being of a public nature, and exchangeable with similar studies on the part of like societies abroad, removes any excuse for starting a business under the handicaps endured by the pioneers. This tends to reduce the waste of effort and capital that would otherwise be experienced.

It is unnecessary to mention the great progress of industry in this country and abroad that has followed these research studies; the constantly improving products, the elimination of avoidable waste, the recovery of by-products and finding means of utilizing them, have combined to give us much of happiness and prosperity.

It is an easy matter to construct a laboratory, and equip it with all the necessary apparatus for chemical and physical research, but the personnel of the research staff is of the greatest importance. It seems to me that research men should above all other qualifications, necessary as they are, be those who are imbued with the idea of service to industry, who will recognize that the experienced men in the shop do know something after all, and that much can be learned from them, and who are in the laboratory to be of assistance to the shop and not to dictate to it. The utmost coöperation between the shop and laboratory force is vital; with it success can be attained, without it failure is inevitable. Therefore in my view the research staff should consist of real men first, and scientists afterwards. This is particularly so with those who in the course of their work come in contact with the shop forces; with others who do purely laboratory work it may not at the moment be so important, but they can never rise above routine work unless they are able to get along without friction with the shop men.

Upon continued and intensified research depends very largely the future of our industries, which are coming more and more into competition with foreign producers for the world's markets. Science applied to industry, coupled with an honest and intelligent labor policy, and high grade business management, will bring industrial success, compared with which, that we are now enjoying will, in future years, seem somewhat insignificant.

Most of the technical problems of the Ceramic Industry are extremely baffling. Difficulties may, and often do, persist for years, before a method is found to correct them. The executive must largely depend upon his laboratory to solve these problems.

One successful operator, when a difficulty arose, used to attack the problem simultaneously, from every conceivable angle. This assured quick results, but he did not know the cause or combination of causes that led to the difficulty; consequently, upon its recurrence, this program was again followed. Obviously, under this plan, no record could be made that would show to others the cause of the particular trouble.

I understand that Edison has done his work more by the process of elimination. I believe it was he who said that "Genius is more perspiration than inspiration." It is said that in his search for a substance that would intercept the X-ray, every known substance was tried until certain forms of natural crystalline zinc sulphide, and later, calcium tungstate, made the fluoroscope possible, and men were able to see bones and obstructions through the human flesh.

Attacking problems of research in this manner, and duplicating at will in the laboratory the effects desired, and also those that are to be avoided, clearly point the way toward the desired end. Careful notes can be made of such a method of attack, and these will show the present executive, or

his successor, the way to get certain effects, or to avoid or correct certain difficulties. This, therefore, puts the manufacturing operation in a technical industry somewhat under control, and safeguards the business.

In addition to its research work, the laboratory may be of great assistance to the purchasing department, in checking up, by physical or chemical examination, or both, the character and condition of the various materials and supplies daily received. This often points to the rejection of some particular lot of material as not being suitable, or according to specifications, and thus saves considerable manufacturing loss. It is highly important that every lot of material entering into the wares produced should, on receipt, be carefully examined and tested, to insure uniformity in the product. The executive must depend upon his laboratory for this work.

Occasionally it is desirable to examine the possibilities of the substitution of one material for another, either to reduce the cost, or to better the product. In order to proceed safely, long and tedious work is necessary, in order that, to gain some desired results, other qualities are not sacrificed. Notwithstanding long and careful laboratory work, it usually takes a shop demonstration on a large scale to insure final results. All of this may take months, or even years, to accomplish, but it is the price that must be paid for progress.

When the executive can delegate to his research staff all of these problems, and the staff and shop work in harmony, he can then devote practically his whole time to questions of finance, sales promotion, labor relations and business possibilities. If his business is large enough these lines of activity are delegated to competent officials, thus leaving him free to keep but a general oversight of the business of which he is the executive head, and allowing time for the planning of greater and better things.

Onondaga Pottery Co.
Syracuse, N. Y.

THE ART OF MANUFACTURE AND THE MANUFACTURE OF ART[1]

By Charles F. Binns

In Alice in Wonderland, Humpty Dumpty says that when he makes a word do a lot of work, he always pays it extra. Under such an arrangement as this the word "Art" must be almost ready to retire on a competency and I, for one, wish it would. Few words have been used with a wider meaning and with less intelligence. The use has ranged from art pottery to tonsorial artist and I am not sure but that the second application is more pleasing than the first. The extensive use of the term makes it necessary to limit or define the sense in which it is to be under-

[1] Pittsburgh Meeting, Feb. 12, 1923.

stood. We are not speaking of the Fine Arts, Painting, Sculpture and Architecture, nor of the Arts and Crafts with their connotation of dilettantism and bric-à-brac. Rather let us think of art as expressing the applied skill of the conscientious worker whether in plastic form, color or line, for it is in these that the ceramic worker expresses himself and makes his appeal for understanding and acceptance. It will not do to fool ourselves and imagine that we possess that which in fact we have not. No progress can be made unless the true condition is realized and candidly faced. We Americans like to believe that we can do anything that any other people can do but this is not always true. We are still confronted by large importations of wares which, rightly or wrongly, are esteemed by the purchasing public as being of higher quality than the domestic product. We must therefore ask ourselves, and must insist upon straightforward answers, first, whether we are manufacturing wares which are in fact equal to these, that is, whether the alleged superiority of imported wares is imaginary or real, and, second, whether we are really interested in producing such wares or are content to go on as we now are, admitting the superiority of the foreign goods but willing to admit it and satisfied if only we can sell, if not an inferior, yet a less ambitious product by the car load.

I do not intend to discuss the strictly decorative wares or tile or scheme goods or anything but the regular table wares of the household. As the matter now stands, we are manufacturing enormous quantities of general ware which is for the most part decorated as open stock patterns. This idea has a potent charm for the manufacturer and the dealer. It has its conveniences also for the consumer who can at any time replace losses without difficulty but it does not make for the excellence which resides in individuality. It affords but little opportunity for the expression of personality in design and denies a place to the fine quality which appeals to the discriminating purchaser. The production of open stock patterns may and probably does present the simplest and most profitable plan for running a large manufactory but the unfortunate result is that it predetermines and stereotypes methods so that the introduction of anything different, even if superior, becomes, if not impossible, exceedingly inconvenient. Let me not be understood as condemning the open stock pattern. There is no reason whatever why good designs should not be set forth in this way and there are good open stock patterns both domestic and imported on the market. The point of my criticism lies in the acceptance of mass production as the most desirable and even the only profitable plan. It lays stress upon convenience and economy rather than upon quality and yet it should be made clear that a good design does not necessarily cost more to reproduce than a bad one.

If my observation has been correct and representative, it tends to show that very few of those who are charged with the production of decorations

have had any training in the principles of design. Indeed very many patterns speak for themselves. They do not satisfy a discriminating taste. Of course, the answer may be that they are not meant to; they are produced for the multitude and must be inexpensive so that the multitude may buy largely. That may be all right if this is our only aim, except that there is discriminating taste even in the multitude, but if we have no other purpose we must not cavil at imported wares.

In opposition it may be argued that the possibility of purchasing abundant supplies of decalcomania prints has relieved the manufacturer from the necessity of employing a designer, but as a matter of fact, the offering of these prints has placed or should place the burden of selective taste upon the buyer or purchasing agent. Too often, apparently, designs are prepared and prints selected for no other reason than that they can be used by the transferrer equally well on every shape and without calling for any skill except a rapid and dexterous fingering. As a matter of fact, we have forsaken the art of manufacture and have become ensnared by the subtle wiles of the manufacture of art.

But art is essentially individual. If it means anything at all it means the expression of an idea, and mass production tends to destroy this. The criterion of fine workmanship is merged in the satisfaction of the manufacturer in seeing that his wares in their passage through the workrooms are all going one way.

If the truth must be told, we have become impatient of taking pains. We are devoted to automatic machinery and the more nearly our employees approach automata the better we are pleased. To some of us the ideal method of making dishes would be a series of endless belts, the work people in long rows each adding a touch to the passing pieces until they are delivered complete to a continuous kiln and from this to the packer.

I am fully aware that the producer of these wares denies that he has any mandate to educate the public and as long as his product finds a ready market he is satisfied. But we cannot remain indefinitely under the protection of a high tariff. Sooner or later we will be compelled to market our wares upon merit and without fear of foreign competition and we shall be wise if we take counsel and look ahead. The Art Division of this Society believes in preparedness. It aims at placing in every manufactory some person, man or woman, who has undergone a regular training in design and the harmony of color, who is able to judge between good and bad workmanship, who has authority to decide upon the production and selection of decorations, and whose aim is the establishment of the product upon a plane which will reflect credit upon the producer and will appeal to the discrimination of the purchaser.

Two objections, more or less valid, may be advanced against this course: first, a person placed in such a position would probably, in our democratic

passion for titles, be styled Art Director and would be classed as a non-producer, and, second, in consequence of this the expense would be considered as an addition to overhead. Without presuming to dictate to the management of any plant I think we are wrong in regarding a designer as a non-producer and one who selects designs must be at least a potential designer. And further, there is no reason why such a person should not actually produce designs, to be wrought out, if the factory has no department of lithography, by a commercial house. This plan would also have the advantage of providing exclusive decorations. There is a conspicuous lack of individuality in our table wares. Each important European factory has a style of its own and it is not difficult to recognize its product but I do not think that this can be said of us. Back of this there is the important factor of esprit de corps and pride of product. The whole staff should work together in attaining and maintaining an ideal but this is only possible where there is a controlling mind trained to discriminate and to advise. It has of course occurred to you already that persons trained for such work are not at present available and I regret to admit that this is to a large extent true but once let it be known that there is a demand for them and there is no doubt that the supply will be forthcoming. It is of course necessary that anyone undertaking this work should be familiar with the methods of production. This has so far seemed to be the imperative thing that in nearly every case where a superintendent of decoration has been employed the choice has fallen upon a member of the decorating staff. If this is to be the accepted method the person so chosen should be sent to an established school for a thorough course in drawing and design but I venture to think that it is easier to drill a trained designer in the technique of the factory than to teach the sound principles of design to one who has learned his trade at the bench. As I do not want to present a one-sided discussion I will state the opposite view that one who has been brought up in the atmosphere of the workroom can be and usually is selected because of a certain power in dealing with other workers. This is a very important qualification and is difficult but I think not impossible to acquire.

I am not expecting that these ideas will be received with enthusiasm nor that immediate results can be secured. I am trying to look ahead and I ask you to share the vision. There does not seem to be any good reason why a given manufacturer should not select one or two promising young persons and provide for them the necessary training. There are probably local schools of design to which such persons could be sent or if not, it would surely be possible for manufacturers to combine to organize such a school. I recall the potent influence which has been exercised by the Burslem Art School in Staffordshire and by the Lambeth School upon the Doulton Wares.

The whole matter harks back to the question with which we began our discussion. Do we care? Are we satisfied? If the Art Division means anything at all it means that the SOCIETY which gave it birth and which is endeavoring to foster it, believes that it has a part to play and that part can be nothing else than to stimulate and promote the development and, if necessary, the improvement of our product.

It should be feasible for anyone in control of a properly equipped manufactory to create a small department for the express purpose of producing fine wares. Even without any change in body, glaze or fire a great deal could be done and when the first step was taken numerous possibilities would present themselves. It is not likely that such a venture would at first be profitable in cash but it might be made the means of establishing a reputation and anyway it would afford a whole lot of fun. "Oh, well," you say, "we are not in business for fun; we would not be here at all if we did not make money." But I say to you that the man who sticks in his office only long enough to make money enough to have time enough to get away to the country club to play golf is not the successful man. He says in effect, "this job of mine is not a life, it is only a living. If I can make it profitable I will get my fun outside of it." The fact is that if a man does not get any fun out of his daily work he should hunt another job, for the life is more than meat.

We cannot stand still and I repeat that we must not deceive ourselves by the bold advertisement of an advance which is only imaginary. Judging ourselves by ourselves and comparing ourselves among ourselves is no more wise in manufacture than in behavior. Let us at least select the very best examples that can be procured and set them before our operatives, not to be copied but as an illustration of the qualities which are acknowledged to be of the highest class and to which we hope and expect to attain.

NEW YORK STATE SCHOOL OF CLAYWORKING AND CERAMICS
ALFRED, NEW YORK

RELATION OF THE ART DIVISION TO THE OTHER DIVISIONS[1]

BY FREDERICK H. RHEAD

It is impossible to discuss the present and potential possibilities of the Art Division without considering its relation, duties and obligations to the other Divisions.

We limit these possibilities to the extent that we fail to recognize our relationship with the various ceramic activities which include in their organizations one or more of the many types of art or craft specialists.

An interest in a particular Division need not and should not become so detached that its program tends to become the concern of one particular

[1] Art Division, Pittsburgh Meeting, Feb. 13, 1923.

group of specialists to the exclusion of other groups who are more or less involved in the general scheme of production.

The complexities of ceramic work are such that no one group—however well informed and well equipped it may be—can tackle with the full possibility of successful accomplishment its own particular problems without finding itself on ground outside its own range of investigation or research. For instance, the manufacturer of chemical porcelain finds himself immediately concerned with refractories and possibly heavy clay products.

His problems of design, shape construction, modeling and mold construction would be worked out by specialists following the activities of the Art Division.

The manufacturer of architectural faience and terra cotta is, or should be, intimately concerned with the artistic quality of his product—a quality, by the way, which is emphasized or diminished according to the intelligent degree of censorship or direction given to the execution of the work during the planning, modeling, moldmaking, clay-working, selection of color and general technique. A good original design is of course an essential, but a good original design may be altogether ruined by lack of competent direction or execution during any stage of the work.

Competent direction and execution of ornamental or decorated wares of any description are only possible when competent directors and productive specialists are being used, and it is equally obvious that such specialists besides following their own field of research and investigation should in a general way keep well informed of the practical and technical developments in the various fields.

On the other hand, the practical and technical specialists should realize that the decorative specialist is an equally essential productive force possessing a potential field of investigation just as great as that of the practical and technical field.

The Art Division is organized in the interest of artistic and decorative development. The field of research covers shape construction, design, decoration, color development, modeling, moldmaking, applied decoration in various forms, the mechanical decorative processes such as decalcomania, printing, stenciling, etc. These methods may be invented or developed by the practical or technical man, but they must be used with some appreciable amount of artistic expression if truly artistic wares are to result.

The practical activities of the ceramic art specialist cover a wide field, much wider than is generally recognized. Even in a single plant producing one type of ware, there may easily be from three to six men each engaged in a different class of work. Take the average whiteware plant, for instance. There is, or should be, the Art Director, or the man who is responsible for the designs and decorations. There is the modeler, re-

sponsible for the models and relief ornament. There are the painters and decorators. In the English plants where there is still some printing, involving copper plate engravers, there are also the people who do the mechanical decorating, decalcomania; and the gilders, all specialized help, and all doing an entirely different class of work than the specialists working in an art pottery, tile, faience or terra cotta plant.

A designer of table wares may have only the most superficial knowledge of architectural styles, but he must know historic ornament, and he must be able to make highly finished and daintily executed decorations that will be acceptable to the best artistic judgment of the day. If he is called upon to make a design for a plate border in Italian Renaissance, the design must be Italian Renaissance and not a mongrel concoction plainly showing his own ignorance, and advertising his concern to everybody initiated in art as a concern possessing no artistic influence or ideals.

There are manufacturers who may retort that they are not interested in artistic productions, but in popular sales; or in other words, so long as there is no particular public censorship in regard to mediocre design and badly executed decorations, mediocre designs and badly executed decorations will be the rule rather than the exception. But as every business man knows, what will sell today may not sell tomorrow. Just as the manufacturers are learning more about the possibilities in business, so is the general public learning more about quality and style. Even the manufacturer who will not cater to those who know good design admit that there is such a thing as a change of fashion, and that a design that was popular ten years ago may not sell today.

This means that there is definitely such a thing or force as public opinion in such matters, and also that this public opinion does influence the manufacturer to the extent that he changes his decorations every little while. As this public opinion becomes more discriminative, the manufacturer either makes a better product or limits his market to that public which is not so discerning in taste.

The standards of artistic quality do not concern the manufacturer of products alone. They concern the business and domestic life of the nation. We are more interested in Art, or if you prefer, good-looking products than we were twenty years ago. Art and decoration is now being taught in the schools at a cost of some millions of dollars a year. Both the manufacturers and the employees are paying taxes to teach the younger generation an appreciation of art with the result that this younger generation will be educated to the degree where it is likely to turn up its nose at our own wares and buy European and even Japanese productions.

To the manufacturer who retorts that his particular product is selling, one can only reply to the effect that his foreign competitors' product is

selling also, and that a considerable portion of the purchasing public prefers this foreign product to the domestic ware.

For instance, according to a recent industrial report, the foreign imported decorated china ware displaced the domestic product to the extent of about $18,000,000.

We have made such strides in practical and technical clayworking that this preference is not based upon practical and technical excellence. It is based largely on the general appearance of the ware; not entirely, because many purchasers are taught to believe that a foreign article is superior to our own. A dinner service that is known to be French china has an appeal and a sales value that an American china has not yet earned.

But there are many signs by which the progressive manufacturer may gauge the coming popular taste; and these are signs that he can easily recognize. I have mentioned art training in the public schools. The consequent results are obvious. While we are considering the education of the public, let us glance through the pages of a popular weekly magazine. Note the advertisements for American manufactured products. Hundreds of thousands of dollars are spent every year for decorative advertisements for products which in themselves are neither decorative nor artistic. Tobacco is not an artistic product, yet one concern will pay from two to five thousand dollars for a painting or drawing to be used as an advertisement. Soap is not an artistic product, yet within the last ten years, one of the largest soap factories in the world has developed its business by means of its publicity campaigns in which it used carefully designed decorative advertisements.

If a cleverly planned artistic appeal will sell tobacco, soap, etc., it is surely obvious that such products as table wares and other decorated potteries will have a wider appeal and market, if the designs and decorations are planned and executed by competent decorative specialists. A condition where a soap manufacturer will pay from two to twenty thousand dollars for a drawing or painting for advertising purposes, while a manufacturer of art products will balk at an expenditure of fifty dollars for the actual design for a dinner service, re-acts in favor of the soap manufacturer.

The sausage and soap manufacturer go abroad in their million dollar yachts, while the pottery manufacturer stays at home with his nose to the grindstone, and he is lucky if he can escape his desk to the extent of a dozen games of golf in a year.

Even the moving picture industry with its present tremendous popular appeal is paying an enormous salary to an individual, who is engaged simply and purely to raise the standard of the product.

These ideas are not original, and they are not new. They have frequently been more or less forcibly expressed by various prominent Ameri-

can manufacturers of general ware, and further, enough good work has been done within the past ten years to demonstrate the fact that the American potters can produce wares of good design.

But if it requires a Coles Philips, a Maxfield Parrish and a Leyendecker to make designs that will sell soap, tobacco and sausage, then you may be quite sure that it will take an artist equally gifted and skilful to make designs that will sell crockery. And when you do realize this, you will find that your products will have as big a sale as some of the nationally advertised wares.

It is well to bear in mind that it costs as much to reproduce a bad design as it does a good one. And further, the general ware manufacturer is in a much more favorable position than is the art potter and the tile and terra cotta manufacturer. General wares are mechanically decorated. The artistic quality of general ware depends almost altogether on the quality of the original design for the shape and decoration.

If this is good, the resulting product is artistically acceptable, but if the design is bad or not acceptable to the best artistic taste, no amount of technical or practical excellence will make that product acceptable. And again, if the manufacturer is willing to test the market with an acceptable design, he does not have to wait for the much needed industrial art schools plus the five or ten years involved in training designers. We have the best designers in the world today, but these men are engaged, as stated, in the other industries. While the general ware manufacturer may not be able to pay the salary demanded by some of these designers, he at least can pay what would be considered a reasonable price for a first-class design, especially as this first cost is the final cost as far as the quality of the decoration is concerned.

In discussing this question I would like it to be clearly understood that I do not advocate any new or radical change in the present style or arrangement of general ware design. A clever designer can take any artistic "best seller" and make it over in such a way that the uncultivated critic would not recognize the change, while a person who knows a good design would distinguish the difference at a glance. The result of such a procedure would be to include as prospective purchasers not only those who are unable to recognize the fine qualities in decoration, but also those who do. Or in other words, the clever designer is much better equipped to appeal to those who do not understand design than the unskilful designer, while the latter can never hope to interest the ever-increasing number of people who do possess good taste.

To put the case in yet another way, the popular market, so-called, is, as stated, becoming more fastidious. It is both able to recognize and demand better designed clothes, furniture, jewels, moving pictures and automobiles. Even Henry Ford is once in a while compelled to improve

the appearance of his "Tin-Lizzie" if he is to hold his market. So it is, I think, reasonable to assume that the manufacturer who makes a business of producing decorated wares will before long produce wares that will seriously compete with European products.

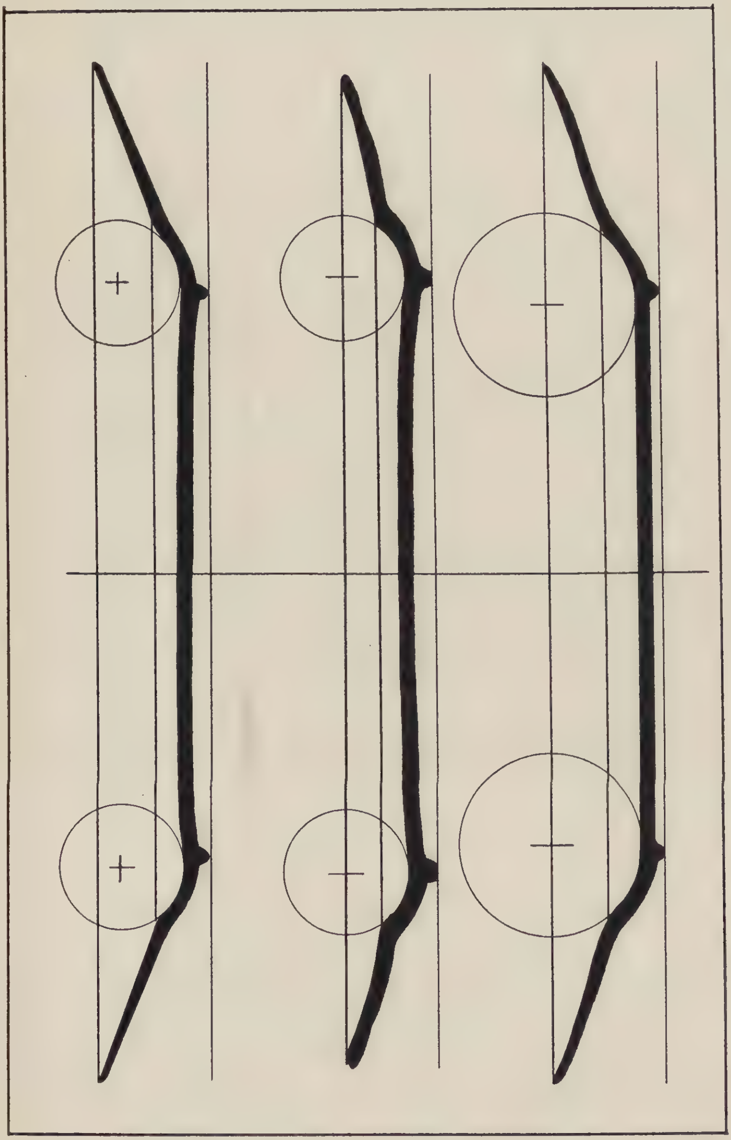


Fig. 1.—Sections of plates measured from actual examples. The finished shape is seldom, if ever, absolutely under the control of the designer or modeler, because it is always subject to a variation both in regard to size and shape, which in the absence of a properly defined specification and variation allowance cannot be accurately estimated.

While there has been considerable research work in connection with the technical branches of general ware practice, there has to my knowledge been little or no real research in either shape construction or decoration.

It is even quite possible that few manufacturers and even ceramic designers know what such research involves.

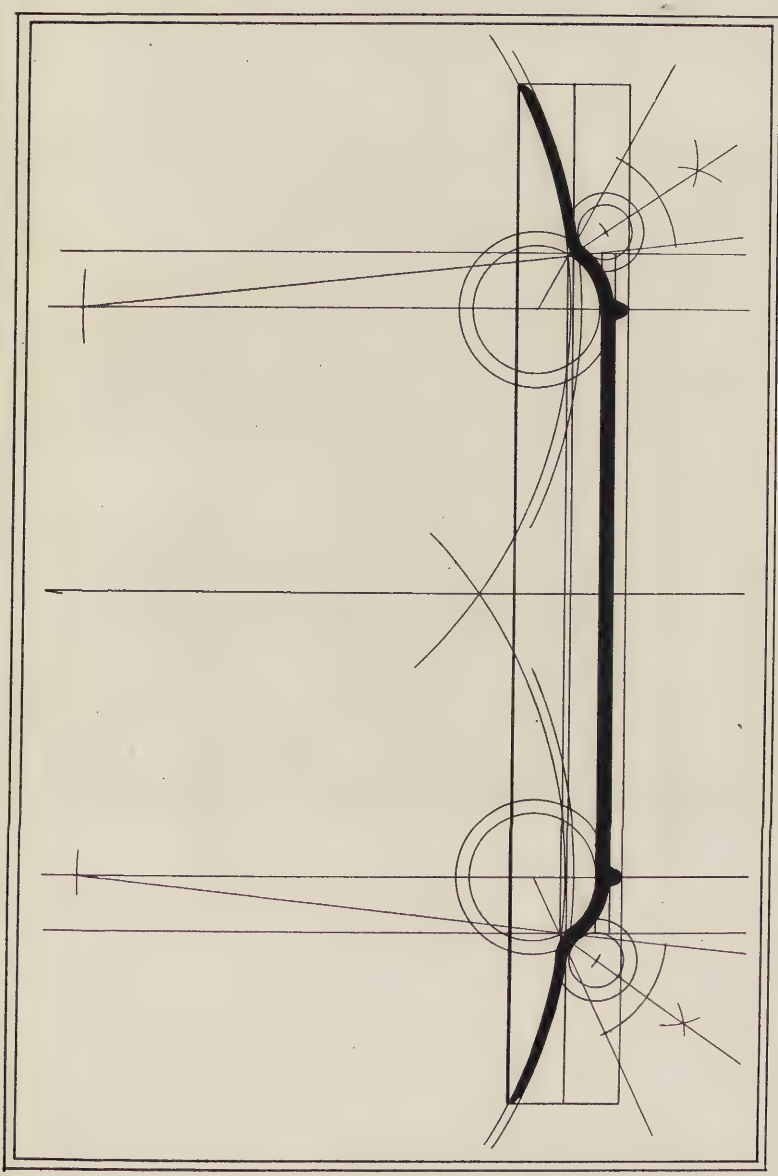


FIG. 2.—Plate section based upon a definite measurable construction. If a section of the finished plate be measured and checked up with this working drawing, the exact degree of variation can be determined, supplying data which would contribute to a more accurate shape control.

For instance, take the average nine-inch dinner plate. Consider shape construction first. Aside from the general appearance of a nine-inch plate, how many manufacturers and shape designers know whether the base of

the plate should be five, four, or six inches; or the most practical height and width of the foot of the base?

What investigation has been made to determine whether the body of the plate inside the rim should be modeled exactly flat, or if not, just what degree of concavity or convexity should be adopted to prevent the inside of the plate from rising or sinking in the middle while it is being fired?

Just what is considered to be the most desirable width for the rim of the plate and the most acceptable height of the rim from the base? In those plates which are placed flat in the sagger, how much is allowed for the settling or dropping for rims of various width and height?

I am speaking from a purely practical point of view with some consideration of the preventable losses due to warping, etc.

Has there ever been a systematic study of sections of plates made by the factories of various countries, and is there a general ware plant in this country where such an investigation has been worked out?

In those factories producing vitreous or feldspathic porcelain, I believe such an investigation would result in determining a plate construction which would minimize warping during the drying and firing.

So far as mold construction is concerned, this branch of the activity is generally left to the judgment of the modeler and mold-maker, and it is a question if there has ever been a serious systematic study to determine the most suitable thickness, shape and type of molds for various articles to be cast, pressed or jiggered. I do know of one or two isolated instances where the standardization of thickness of the mold for articles of various sizes has resulted in the saving of carloads of plaster, and also in increased shop efficiency. In addition, a large waste of plaster has been practically eliminated by the simple means of providing the mold-makers with a round or square iron frame into which surplus plaster has been poured to be used for setters.

There is little doubt that increased efficiency and a big saving of plaster would result if well planned working drawings or blue prints were used by both modeler and mold-maker. For by this means the model could be closely checked up before it was turned over to the mold-maker and the exact method of mold-making would be established and controlled. Then there is the research work covering investigation in connection with the decoration of the plate. Assuming that a standardized nine-inch dinner plate had a one and three quarter-inch rim, and that the curve to the inside of the plate was based on a one-inch radius. This would leave approximately five inches for the center of the plate, so the available field for decorative purposes consists of a circular border nine inches in diameter and one and three quarter inches wide; a narrow curved circular border, and a flat circular space in the center of the plate five inches in diameter.

Considering the possible decorative arrangements, we find the following combinations:

1. A flat circular panel five inches in diameter surrounded by a narrow frame or border and a wider border occupying the entire rim of the plate.
2. A flat circular panel five inches in diameter surrounded by a narrow frame or border, but with no border on the rim other than the gilt or colored edge.
3. No decoration in the center of the plate, a border covering the entire rim framed by a narrower border arranged around the inside of the curve.
4. A border occupying the entire rim of the plate, but no decoration around the curve or in the center of the plate.
5. A border occupying less than the available space on the rim of the plate.

While those quoted are the possible arrangements, the majority of present day dinner ware designs consist of a border occupying all or a portion of the outer rim of the plate.

In considering the possible decorative motive, we have two broad groups:

First, naturalistic decorations of floral and other natural forms arranged and interpreted much as they appear in nature, and secondly, conventional decorations, or natural forms converted into ornament more or less abstract or symbolic in style. As each country and period developed its own individual style, we have at our disposal a wide range of distinctive historic and modern decorative types, the most notable, or at least the most used, being possibly the Grecian, Italian and Chinese. The Persian, Japanese and French have also been prolific sources of inspiration.

The modern designer, however, has struggled to develop a style that is entirely original, but with no particular result to date except the more or less mongrel interpretations which can easily be traced to their original sources. This is not the place to analyze the various types and styles of ornaments. It is only necessary to state that the competent designer must know these types, and that each progressive plant should have filed for reference purposes either good reproductions or actual examples of these various types or styles.

As fashion changes, and as there is evidence of the coming of a particular fashion or style, the manufacturer or the designer can select one or more decorative styles for his new productions. In gauging the possibility of future markets, these defined conditions should be closely observed.

Often these are neglected for more superficial signs. For instance, the manufacturer will take close cognizance of new importations and try as closely as possible to follow them.

Would it not be a more rational method for the manufacturer to follow closely the prevailing decorative styles in other industries? The textile,

wall paper, carpet and furniture interests through their big industrial exhibitions define to a great extent what the coming popular style will be. The various fashion magazines are valuable sources of information. Certain authentic decorative types are always more or less marketable, but there is generally a predominating style and color which appeals for a period of a year or so to a great popular market. Consequently an approximate estimate of this condition is pretty sure to result in a popular seller, which is what we are all after.

But the point I am trying to make in connection with the decorative research is this, that unless a chief designer or art director is constantly investigating these conditions, collecting authentic examples or reproductions of examples properly classified and filed with data covering costs, markets reached, sales, etc., and supplementing this data with carefully worked out drawings based upon the present acceptable space combinations given, he will never be any better able to interpret the market than he is now.

The efficient art director should not only be concerned with the production of half a dozen or so different patterns a year, a group selected say from twelve to twenty designs, but he should have scores and hundreds of research or development drawings, showing variations of different acceptable styles. To an expert designer, the making of an actual drawing is but a matter of an hour or so. The most finished design for a dinner plate can be made in about half a day. So far as the actual drawing is concerned, little labor is involved. But this finished design may be the final development of hundreds of previous sketches.

The trouble with most of our ceramic designers is that they do not draw enough. When only a dozen or so sketches a year are asked for, a drawing begins to assume the proportions of an undertaking instead of a casual incident in the course of a week's work, and the designer, because of his lack of practice, does not acquire the facility of execution, or knowledge of the historic styles that are the stock in trade of the commercial designer in other fields.

A plate design seems a simple undertaking, but assuming that both the shape and design are finally developed, there are a hundred possible color schemes, even if only two or three colors are to be used. While a simple border may not show the amount of work involved, a perfectly designed plate with a well balanced color scheme may easily be the result of work covering a period of time of a year or more.

Consider the amount of work involved in connection with the development of a single body and glaze, and then consider how little true research work is done in connection with decoration and color arrangement.

The Art Division is definitely interested in design and decoration in relation to the general ware industry, and in addition, in constructive

criticism such as is here offered with due respect for the problem and the conditions involved. We hope to arouse the interest of the whiteware manufacturers to the extent that we can present contributions to the *Journal* covering various phases of decoration and shape construction development.

I am conscious that many of the points raised in this paper require further elucidation and elaboration, and when the opportunity offers, this will be done.

At this time it is enough to state that the Art Division realizes and recognizes the need for important constructive work in the interest of the whiteware industry.

This recognition extends also to other branches in the ceramic field. We have a rapidly increasing market for art, tile, faience and terra cotta wares of a class that will compare favorably with the best work in marble and bronze. And within a few years at most the work of the potter will be exhibited side by side with the work of the great artists of the country.

But we cannot expect this privilege or the increased business that will result from such an advance until our draftsmen, artists, craftsmen, decorators and modelers are properly equipped and efficiently directed. And in regard to the latter, the direction does not involve only the active head of the department, it involves the manufacturer himself, or the business head of the organization. It is not, of course, necessary that the manufacturer or general manager be a decorative process man. But it is essential that he has an appreciation both for the finished product and the difficulties involved in its production.

As previously stated, there is a wider field for investigation in connection with art wares, tile, faience and terra cotta than in the white utility wares, because there is a wider range of decorative processes and a larger practical field. For this reason, the Art Division is interested in such activities as:

1. Industrial schools.
2. Practical clayworking processes relating to various types of ceramic ware.
3. Draftsmanship in connection with shape construction.
4. The ornament and architectural styles of various countries and periods.
5. Ceramic design.
6. Decorative ceramic processes.
7. Color standardization.
8. Supervision and direction in educational and industrial ceramic art activities.
9. Educational programs as outlined by Mr. Boudreau.

To mention but a few broad subjects of vital concern to many of those interested in the other Divisions.

Life is so short and the complexities and intricacies of ceramic work so involved that no one person can ever hope to know but little about it. For this reason, if for no other, those who can in any way contribute to our present knowledge should do so, not only because they add to the fund of total experience, but also because they themselves will benefit by participating in the general development.

American Encaustic Tiling Co.
Zanesville, Ohio

HISTORICAL SKETCH OF THE MANUFACTURE OF PLATE GLASS IN AMERICA[1]

By C. E. Fulton

In a brief history of the plate glass industry such as this, it will only be possible to describe the early attempts at plate glass manufacture and touch upon the outstanding developments which have been achieved.

The first attempt to introduce the industry was at Cheshire, Massachusetts, in 1850. This plant was later removed to Brooklyn, New York, but the company soon failed. In 1865, Theodore and James Roosevelt of New York formed the National Plate Glass Company and erected a plant at Lennox, Massachusetts. Machinery was brought from England, and although for a while this Company was more successful than the first organization, it also met with disaster and was discontinued in 1871. After this date further attempts to establish the industry in this country are connected with Captain John B. Ford, and a brief biography of Captain Ford and his various enterprises will be of interest.

He has been termed the "Father of the Plate Glass Industry in America," and when it is realized that he was the first to make a satisfactory product in this country at New Albany, Indiana, and the first to put the industry on a paying basis at Creighton, Pennsylvania, he is rightly deserving of this title.

He was born November 11, 1811, in Danville, Kentucky, and before engaging in the manufacture of plate glass had an interest in a number of diversified industries. The management of a store, manufacture of safes, saddle-making on a large scale, building steam boats, commanding Ohio River steamers, and an attempt to make glass sewer pipes were some of the activities of this versatile man.

At the age of 58 he became interested in the manufacture of plate glass, and, after studying the methods used in the previous efforts in America and the methods relative to European practice, Captain Ford with his brother-in-law, Washington Irving DePauw, built a factory at New Albany,

[1] Received Feb. 27, 1923.

Indiana, in 1870. As in the earlier attempts, the machinery was purchased in Europe, but before it arrived the buildings were destroyed by fire. Undiscouraged, new and larger buildings were erected to take their place, and New Albany has the distinction of being the first place in America where a satisfactory quality of plate glass was made. This venture met with some success, but in the language of the census report for 1880 "it had to undergo the reverses that seem the fate of all plate glass houses in this country." A second factory was erected by Captain Ford at Louisville, Kentucky, in 1873, and a third at Jeffersonville, Indiana, about 1875. A fairly satisfactory quality of glass was produced but they also failed after operating for a few years.

Before continuing with Captain Ford's efforts, it should be stated that the American Plate Glass Company was organized in 1876 and a plant erected at Crystal City, Missouri. One year later the corporate name was changed to the Crystal City Plate Glass Company with the late Hon. Ethan Allen Hitchcock as president. This plant has since been entirely rebuilt and is one of the largest plants of the Pittsburgh Plate Glass Company.

Some time later, Captain Ford became associated with Mr. John Pitcairn of Philadelphia and formed the New York City Plate Glass Company. The name was changed in 1883 to the Pittsburgh Plate Glass Company and a plant built at Creighton, Pennsylvania. This plant is still in existence and is known as Works No. 1 of the Pittsburgh Plate Glass Company.

Between the years 1885 and 1895, Captain Ford was instrumental in having plants erected at Tarentum and Ford City, Pennsylvania, the latter place being named in his honor. He died at Tarentum in 1903, at the age of 92.

Prior to 1880 not a square foot of plate glass had been made in the United States without financial loss to the manufacturer, but according to government reports the cost in 1884 was only one-half of the cost previous to 1879, due largely to the proficiency attained by the workmen. The same report gives the number of men engaged in the industry as 956, and the annual production at a little over one and one-half million square feet.

In all these early factories the European methods were used and European practices closely followed. The method in general was to fuse the raw materials in pots or crucibles placed in regenerative furnaces. When thoroughly melted and fined, the molten glass was poured on a cast iron table and rolled into a plate, after which the plates were placed in an annealing oven or kiln to remain for several days and the temperature was gradually decreased to a degree where the glass could be handled. The glass at this stage was about one-half inch thick and contained many surface irregularities and imperfections. These rough plates were drawn from the annealing kiln and examined; after cutting to eliminate the more

glaring defects, they were sent to the grinding department. In this department they were laid in plaster of Paris, upon square or octagonal shaped tables and revolved under iron shod runners, while sand ranging from quite coarse sizes to very fine was thrown on the glass until a flat surface was obtained. The plates were then turned over and the process repeated until both sides were finished or ground, the time required to grind each side being from eight to twelve hours. The plates were then removed, cleaned and again imbedded in plaster held by wooden frames, and rubbed one against the other by an eccentric motion, emery being worked in between the surfaces until a finely ground surface was obtained. When both sides had been smoothed in this manner, the plates were sent to the polishing department for final finishing. The polishers comprised square wooden tables upon which the glass was again laid in plaster and felt covered blocks were lowered upon the glass and the surface rubbed by a sliding motion until the desired finish was obtained. As is still the case, rouge was the polishing medium used. After this operation the glass was sent to the ware room where it was examined for defects and cut into size.

The modern plate glass plant still follows the above outlined procedure, only upon a much improved and more efficient basis. Very few changes have been made in the composition of plate glass or in the materials used in reducing the rough uneven surface to the familiar highly polished plate. However, various proportions of the ingredients used in the plate glass batch have been studied and better combinations have been adopted which produce glass of a superior quality. The various ingredients entering into the batch are subjected to chemical analysis and a much higher standard of purity demanded than was formerly the case.

Enumerating the major improvements which have been made, the first on the list is the grinding and smoothing operation. In 1889, at Crystal City, the English smoothers were abandoned and all the glass thereafter ground and smoothed on grinding machines. This necessitated changing the design of the old machines and round tables were substituted for the square or octagonal type. The effect of this new method was to reduce the grinding or smoothing time by over 50% and led directly to an improvement in the method of polishing. The table or deck on which the glass was laid formed a part of the old machine and it was therefore idle while the glass was being laid or turned over. As one hour was required to lay or turn over a table, and as this operation was necessary several times during the grinding, smoothing, and polishing, the time when the machine was idle was an item of considerable importance. In order to overcome this drawback, machines were designed, about the year 1900, with a removable table or deck made to fit any grinder. A number of extra tables were provided so that no machine would be idle.

Rough glass is now laid on the table, it is placed under the grinder, and when one surface is ground and smoothed, the table is transferred to a polishing machine to have the same surface polished. In the meantime one of the extra tables has been placed in the grinder and the machine is idle for only a few minutes. After the ground side has been polished, the glass is turned over and the reverse side ground and polished in a similar manner. This method requires handling the glass three times during the finishing operation instead of nine times which was necessary in the early factories. Present machines are idle for only the few minutes required to take out a table and replace it with another.

The old type English and Belgian polishing machines were also replaced by the circular type so that the tables or decks from the grinding machines could be placed in a similar machine equipped with polishing blocks. A study of the weights and arrangement of the polishing blocks, and the consistency and preparation of the rouge, together with the determination of the proper pressure per square inch and the most efficient speed to rotate the grinder and polisher tables has greatly shortened this operation.

Numerous minor improvements, such as the proper grading of the sand and emery, and the advent of electrically driven machinery has contributed to the success of this operation. Prior to 1889 when the first of these improvements was introduced, about ten days was required to produce a polished plate of glass from the raw materials. In the modern plate glass industry, it is now possible to deliver a mirror to your home, or put a plate glass top on your desk, in less than thirty-six hours after the sand, lime, and soda are placed in the crucible.

Another radical change or improvement was effected in the casting or melting department about the year 1900 when a continuous annealing leer was built at the Floreffe, Pennsylvania, factory of the Pittsburgh Plate Glass Company. The leer is a long low tunnel connected to a series of ovens (usually five). Immediately after the plate is rolled, it is placed in the first or hottest oven and at regular intervals is moved into the succeeding ovens until it reaches the runway or leer proper, where it is automatically carried on steel bars to the cutting table at the delivery end of the leer. The temperatures in the ovens and leer are so arranged that the glass is slowly cooled from 1200°F to 100°F. By this process only a few hours are required to properly anneal a plate, compared with four or five days in the old type kilns. This leer method of annealing glass was fully developed in America, and it was not until recent years that it was adopted by the European industries. This development increased the efficiency of the casting hall, in that the casting table is now stationary instead of being moved on tracks to the entrance of each annealing kiln, as was the former practice. In this department electricity has also played a prominent part and many devices have been developed for handling the

pots of molten glass and the large rough plates. Furnaces have also been improved and enlarged so that single rough plates containing 450 square feet of glass are now produced.

Within the last ten or twelve years the pot house department has received more attention, and various improved methods have been introduced in the preparation of pot batch. The individual clays entering into the batch have also been studied and while at one time it was thought necessary to use a certain amount of pot clay from Germany, it has now been proven that superior batches can be made using American clays exclusively. The process of building pots has not undergone any material change, although it has been proved practical to make pots by the casting process. In former years it was not uncommon to lose a large percentage of pots during the drying period, but by careful attention and careful control of temperature and humidity conditions, very few pots are now lost during the drying process. Further developments in the drying process have demonstrated that pots can be safely dried in much less time than was formerly required. The size of the unit of production has gradually increased and necessarily the pots have kept pace. In some factories large oval pots are now used, which produce a plate of glass containing 450 square feet.

Summing up briefly the outstanding features, the developments of plate glass industry have been:

1. Increase in all departments of the size of the unit handled.
2. Reduction in the annealing time from four days to a few hours.
3. Completing the grinding and polishing operation in a few hours instead of several days.
4. Extensive changes in the general plant equipment, so that a modern factory bears little resemblance to the plant built fifty years ago.

As late as 1900 with the equipment then in use it was not possible to make and handle a plate larger than 200 square feet, while now plates containing 450 square feet are produced. Instead of giving employment to 956 men and producing one and one-half million square feet as in the year 1884, the potential capacity of the American factories today is approximately one hundred million square feet, and employment is given to 20,000 men. French plate has ceased to be considered as the highest grade of polished plate glass as the American factories produce glass that is second to none in quality. A considerable amount has been exported and is able to compete on a quality basis with European glass.

And now the method of making plate glass is confronted with a new revolutionary process which promises to supercede practically every feature of the existing method, both as to process and equipment, but it is too early to give any details.

Research Department
Pittsburgh Plate Glass Co.
Creighton, Pa.

INVENTIONS AND PATENTS[1]

Some Phases of the Patent Law

By George E. Middleton[2]

Books have been written on the Patent Law. It is a broad subject and has many phases. In this short paper I cannot do more than touch upon it. Yet, having been a ceramic engineer myself, and, in my profession as a patent lawyer, coming in constant touch with engineers, I believe that I understand at least some of the problems with which you are faced in your relations with the patent system, and hope that I can offer a few profitable suggestions which may assist you in approaching these problems.

The mind instinctively associates the word "patent" with the word "invention." And this is quite right. For under our system no one may apply for a patent who has not invented something. But the word "invention" is too commonly associated with the word "genius"—evoking the image of the printing press, the cotton gin, the steam boat, the telegraph, and other classic and epochal inventions. But invention is only rarely like that. It is the multitude of little improvements, of improvements upon improvements, the rank and file of invention, that keep the wheels of progress turning. Then, too, we like to clothe invention with mysticism. In our fancy, we see it spring full-formed from the inventor's brain, like Minerva from the brow of Jove. Sometimes this is so, but not often. The worth-while inventions of today are the products of hard thought, developed after patient research to satisfy a recognized demand. The inventor today is the man in the shop, the engineer, the scientist—the man who knows his art, its deficiencies and its needs.

It has been these engineer-inventors who have made modern ceramics what it is and it is these men who will carry it still further. It is needless for me to speak of the progress of the past twenty-five years, except to emphasize the predominant part which your inventors have taken in it, and still more to emphasize the part which they must inevitably take in all future progress. And when I say "they," I really mean "you." Whether you realize it or not, you are inventors, actual or potential.

Of course, not all the improvements which an engineer makes are inventions. No one has yet formulated a definition of invention—and I cannot here discuss the several negative tests which are applicable—but it may safely be said that a large proportion of these improvements are inventions and are patentable; certainly a much larger proportion than the engineer commonly thinks. Believe me, then, when I say that, whether you know it or not, you are inventors. You are committed to invention.

[1] Pittsburgh Meeting, Feb. 12, 1923.

[2] Member of the New York Bar.

Now the Constitution empowers Congress "to promote the progress of science and the useful arts by securing for limited terms to inventors the exclusive rights to their discoveries," and Congress, acting under this power, has from time to time enacted legislation which forms the basis of our patent system and under which any inventor may, subject to certain restrictions, apply for and receive the exclusive right to his invention or discovery for a term of seventeen years. I suspect that many of you are not enthusiastic over our patent system. I well remember an editorial in the *Journal* not many years ago, which, to say the least, was not fulsome in its praise. Be it so, nevertheless this patent system is so interwoven into our industrial fabric that no industry is untouched by it, and no industry can afford to ignore it, least of all an industry which depends for its very existence on the brains of its engineer-inventors.

Hence, being exposed to the system, willy-nilly, and accepting it as the established order, what are you going to do about it? For you must do something.

A patent is, in effect, a contract. The nation says to the inventor: "If you will invent and disclose your invention to the people (observing certain prescribed formalities), teaching them how to use this new thing which you have conceived and developed, then you shall be granted the right to exclude all others from making, using, or selling it for a period of seventeen years."

The acceptance of this offer is not at all obligatory. You may accept it or reject it, but you cannot weigh the question forever. Within a certain time you must choose. It is imperative. You must bear in mind, too, that the offer is open to all. If you do not accept it, another may. What I shall try to do in this paper is to tell you briefly, not what your decisions should be, but rather what the consequences of those decisions will be. This is, indeed, of vital importance, not only to you as inventors, but to those for whom you are inventing.

Having made an invention, there are two matters to be considered, (1) how can you exclude others from the use of it, and (2) assuming that you do not care for a monopoly, how can you prevent others from obtaining a monopoly in it, excluding you and the public you wish to benefit?

Obtaining a Monopoly

There are just two ways of excluding others. You can

(*a*) Keep your invention a secret, or

(*b*) You can accept the nation's offer, make a full public disclosure, and patent it.

Secret Use

Let us first consider the advisability of keeping it a secret. Having made the invention, it is yours. You have a common law right to it and the

courts will protect you in the exercise of that right against one who obtains it from you by fraud. A patent in no sense gives you the right to use your invention, for, subject to the rights of others, that is your natural right. Thus you may enjoin to secrecy those who work with you or for you in the exploitation of your invention, provided always that the secrecy is genuine. But your position is a precarious one. In the old days, glaze formulae were handed down in secret from father to son and guarded jealously. That was possible then. Today it would be difficult. And once your secret has been discovered by another, by independent invention, by deliberate analysis of your product, or by well thought out scientific guessing, your secret is gone forever, and you have no redress. And once having definitely decided to operate in secret, you have renounced forever your right to apply for patent protection. Thus when discovery becomes imminent, you may not accept the offer of a limited monopoly which, in the first instance, you rejected. Another point: you must actually use your invention. If you discard it you will be held to have abandoned it, provided your actions are consistent with no other course, and a later independent inventor may not only reinvent it, but may get a patent and so prevent your later enjoyment of what was once your own.

In concluding this brief discussion of secret use, it may be pointed out that many inventions from their very nature cannot well be practiced in secrecy, hence if you desire to enjoy a monopoly in the practice of such inventions, the only course open to you is to patent them. Which brings us to consideration of that other method of obtaining a monoply.

Patenting

Our patent laws provide for the grant of patents to original and first inventors only, and between two or more original and independent inventors, *the one first in time will prevail. And between an inventor and* a public use or published description of the same invention, the former will prevail only if his invention is prior to the use or publication. Hence, the question of priority is of utmost importance to those seeking patent protection, and the question naturally arises—when is an invention said to be made?

The inventive act consists of two parts, one mental, the other physical; one the conception of means whereby the desired end can be attained, the other the actual embodiment of this conception,—reduction to practice, as the expression is. In the contemplation of the law, an invention is not complete until it has actually been reduced to practice, and if the inventor proceeds diligently to test out his conception, giving it a local habitation as well as a name, the date of his invention is the date of his conception. But inexcusable delay in reducing to practice may deprive the inventor of the right to carry the date of his invention back to the date of conception.

It is thus incumbent upon the inventor who hopes for a patent not to dream too long over his idea.

It is also incumbent upon him to keep records so that in the event of a contest, either with a rival inventor over the question of priority, or in a suit for infringement, he will have evidence at hand to prove his date and his diligence. It is not enough that your footsteps should echo and re-echo down the corridors of time. Clear and unmistakable footprints on the sands thereof are much more to the point. The existence of an inventive concept locked in the inner consciousness of the inventor is absolutely unprovable. As soon, therefore, as you conceive an invention, you should get it out of your system in some objective form, such as by making a written description of it or a sketch. Or you should explain it to someone who is capable of understanding it and who would testify to the disclosure if necessary. Indeed, it is well to do both of these things. Have someone write on the drawing or written description that he has read it and understands the invention. Then have him sign this statement and date it. Records should also be kept of the subsequent experimental work in reducing the invention to practice. In your research and works control laboratories, the daily laboratory records are usually adequate. In every case, however, it is well to have more than one investigator familiar, at least in a general way, with each investigation and development so that the testimony of the inventor can be corroborated.

There is a mistaken notion prevalent among inventors that if a patent is to be obtained, it must be applied for as soon as the idea has popped into the inventor's head. This is not so. On the contrary, it is much better to wait until experimental work has indicated not only the feasibility of the idea, but the probable lines of development. And as long as this reduction to practice is diligently pursued, no rights are lost, and it may be, and usually is, pursued in secret with no danger that the right to a patent will be held abandoned. As stated before, the effective date of your invention is the date of conception when followed by diligence in reducing to practice. It may happen, however, that actual embodiment of the invention may call for a large outlay of capital, or there may be other reasons why actual reduction to practice cannot be undertaken immediately. In such a case, the filing of an application is advisable, this application being considered a constructive reduction to practice, and in most cases satisfying the requirements for diligence.

It is not even imperative that an application be filed immediately after the invention has been completed. However, after the completed invention has been in public use, or on sale in this country for two years, or described in a printed publication for two years, be that publication here or in the uttermost parts of the earth, a conclusive presumption of abandonment to the public arises, and thereafter the right to apply for

a patent is absolutely lost. The law does not favor him who sleeps upon his rights and after the invention has been completed and proved, an application should be filed without undue delay, certainly within two years.

How to Prevent Others from Obtaining a Monopoly in Your Own Invention and Excluding You

But suppose now that you are a public benefactor and do not care to obtain a monopoly in your invention, although wishing at least to be able to use it yourself. If you have actually reduced it to practice and used it publicly, no subsequent inventor can get a valid patent covering it. But if you have never done this, if, let us say, the invention has never evolved beyond the experimental stage, although you may be convinced of its practical value, this abandoned experimental use will not act as a bar to a later inventor who may independently make the same invention, get a patent and stop you from practicing your own invention, at a later date. An invention which is never reduced to practice, or even if so reduced, never gets into public use, does not anticipate a later invention. It is important to bear this in mind.

How, then, can you prevent another from reinventing your abandoned or uncommercialized inventions, obtaining a patent which shall give him a monopoly and enable him to stop you from reviving and practicing what was once your own?

One solution, and perhaps the most simple one, is to publish the results of your experimental work in a printed publication. The mere reading of a paper at a convention is not enough. If your editor is agreeable (as to which I venture no opinion), I can think of no better medium of publicity than the *Journal* of this Society. The disclosure in this published article should be as complete as possible, setting forth all of the essential data, such as proportions, times, heat treatment, etc.—sufficient to enable one skilled in the art actually to practice the invention. A mere prophecy of probable results will not suffice. Such an article, if containing a clear and adequate disclosure, will make it impossible for a later inventor of the same thing to get a valid patent.

Another solution of the difficulty is to beat the other inventor to it and get a patent yourself. By doing this, you establish a date, at least as early as your filing date, and ordinarily you can carry back your date of invention much earlier. The later inventor must ante-date this to prevail.

Let us consider the effectiveness of these two solutions. If you publish your results, or actually put them in public use, it is true that no subsequent inventor can get a valid patent for the *same thing*. But this same thing, bear in mind, may be only the bare fundamental structure of your invention. Later improvements may, and probably will, be the features which give the invention real commercial value. Hence, a subsequent

inventor, stirred into activity by your publication, may make these valuable improvements upon your basic idea, and get patents which will actually dominate the field commercially and enable him to stop you, along with the general public which, in your altruism, you wish to benefit.

On the other hand, if you patent your invention, *you* are in a position to dominate the field, all later inventors having to pay tribute to you during the life of your patent, if you wish it. You may, of course, grant licenses free to those who wish to use your invention, and thus actually give the invention to the public quite as effectively as you might by a mere publication, more effectively, in fact, because you will be in a position to bargain with the later patentees for the protection of your public. It would still be true that these later patents could prevent your using the commercial improvements which they had made in your more fundamental invention, but as your patent would dominate, they, and their licensees, would be forced to do business with you if they would operate under their own patents.

It is, therefore, important to bear in mind that a dedication of an invention to the public can ordinarily be most effectively consummated through the actual obtaining of a patent. Public use and publication are useful but may simply stimulate activity and result in the issuance of improvement patents which may practically nullify the effect of your generosity.

To Sum Up

Do not stand in awe of the big word "invention." Have respect for your own improvements even though they may seem unimportant, and don't forget that patents are being granted on just such things.

If you wish to retain a monopoly in your inventions by practicing them in secret, very well, do so; but bear in mind that if another discovers your secret honestly your monopoly is gone.

If you decide to retain a monopoly through patents, proceed diligently to reduce your conceived inventions to practice and make applications for patent when this reduction is complete. Keep clear and authenticated records of all your work from conception to completion. File your applications within two years of first public use or sale of the inventions, and within two years of the date of the first description of them in a printed publication.

If you wish to make the public a gift of your inventions, publish a carefully prepared disclosure of them in some printed publication, or preferably, if you wish to protect yourself and the public from the patents of those who come later and improve upon your work, get patents yourself which will be broad enough to exact tribute from the improvement patentees, and thus enable you to trade with them for the protection of yourself and the public.

165 Broadway
New York City

ACTIVITIES OF THE SOCIETY

CHARTER MEMBERS HONORED AND NEWLY ELECTED OFFICERS INSTALLED AT BANQUET, FEBRUARY 12, 1923

The toast-master, Mr. L. E. Barringer, announced the results of the election as follows:

President, A. F. Greaves-Walker
Vice-President, R. D. Landrum
Treasurer, R. K. Hursh
Trustee, R. R. Danielson

Mr. Barringer then asked Professor Orton to take charge of the installation of these officers, and the following exercises took place:

Installation Exercises

Conducted by Professor Edward Orton, Jr., Founder of the World's First Department of Ceramic Engineering and of the American Ceramic Society

Mr. Toastmaster, before I attempt this difficult, and what may perhaps prove to be arduous, task, I should like to have some assurance as to how far my authority will go. Mr. Riddle, will you, as President of the Society until the next member thus honored is duly inducted into that high office,—Will you agree to back me up in any demand that I may make?

The Retiring President, Mr. Frank H. Riddle: Absolutely; go the limit! (Laughter.)

A good deal has been said about these charter members tonight, and most of them were placed on exhibit for a moment in the meeting this morning. But there are a few here who were not present at that time, and who perhaps do not know these men by sight; and I am going to take the liberty of asking them to rise in their places as I call their names, and remain standing for just a moment:

Mr. Charles Fergus Binns, Mr. Albert V. Bleininger, Mr. William D. Gates, Mr. Samuel Geijsbeek, Mr. Karl Langenbeck, Mr. Ellis Lovejoy, Mr. Herman C. Mueller, Mr. Francis W. Walker.

(Applause greeted each charter member as he rose upon his name being called.)

Face out, so they can all see you, boys! *(Prolonged laughter and applause.)*

Now a good deal has been said about the achievements of this little group,—all of a complimentary and flowery nature. My primary purpose in calling them to their feet in your presence here now, is not to laud them any more, but to serve as a sort of an object-lesson to you who are coming on. (Laughter.)

I do wish you to get this point of view. These men do not deserve any more adulation or praise or rewards of any sort for what they have done. They enjoy it; they lap it up, as Mr. Gates has indicated! (Laughter.) But the fact remains that they have been paid. They have been amply and well paid for the constructive work which they have done over this quarter of a century. They have drawn their pay as they went along. They had the fun of getting a big vision, and of seeing that vision come true. And I know that I speak for them truly when I say that you couldn't take the delight and the pleasure from them for the part that they have had in making this Society what it is, any more than the most cherished thing they possess. Am I right? (Applause.)

Well now, the application: These men are just common *homo sapiens*, the same as yourselves. They are not different. The chemists couldn't define their protoplasm as differing from yours. What they did, what they have enjoyed, is absolutely open

to the rest of us. Only one requirement: *Get the spirit that animated them!* And if this crowd,—five hundred of you, representing some nineteen hundred altogether, can animate yourselves with the same spirit and the same delight in doing things for the sake of doing them, that this group has had, the sky will hardly be the limit for the AMERICAN CERAMIC SOCIETY.

Now, there are two names on our list of charter members who can no longer be with us. Let us drink a silent toast to Ernest Mayer and to Jimmie Pass.

(Whereupon, the entire membership rose and drank, in silence, a toast to the departed members whose names had been mentioned.)

I should now like to have present themselves on the platform the following: Mr. Arthur F. Greaves-Walker, Mr. R. D. Landrum, Mr. R. C. Purdy, Mr. Ralph K. Hursh, Mr. R. R. Danielson.

(The gentlemen whose names were called, constituting the newly elected corps of officers of the SOCIETY, presented themselves on the platform.)

Now, ladies and gentlemen, this story that I am about to tell you is old to some of you; but this SOCIETY has grown very rapidly, and it may be new to some of you.

A certain member of this little charter group, Elmer E. Gorton, read a certain paper before the National Brick Manufacturers' Association twenty-five years ago, almost to a day. His paper was no very heavy composition; but it was the first attempt at that time to tell a non-technical audience an elementary fact about what constitutes a glaze, and how a glaze could be controlled. He told this story pretty well. He illustrated it on the black-board. He calculated his mixtures, and he got a respectful hearing from these brick men. It was evident that their attention was wandering from time to time, but they gave him a little perfunctory applause when he got through; and the chairman got up, and with a sort of sigh of relief said, "Well, we will take up next order of business!" Mr. Gorton came out of the hall, and I got up and followed him out, and Sam Geijsbeek, sitting here, followed me out also, and we walked down the hall with our arms around Gorton's shoulder. This happened, by the way, down at the old Monongahela House, at that time the best hotel in Pittsburgh.

As we walked out of that convention hall, Mr. Gorton said, "I don't feel very much pleased. I worked hard on this paper, but there does not seem to be any real interest here." We consoled him as we went along. About one hundred feet from the hall there was an old plush-covered settee—the same settee is there now, I think, that was there then! (Laughter.) I judge so, because the plush came off when I sat down on it twenty-five years ago, and it came off again today! (Laughter.) Three of us went down to our shrine today, and we sat on that old settee and speculated a little about things. On that former occasion Gorton was bemoaning the fact that he hadn't quite rung the bell with that paper. One of us said, "Well, there's only one way to cure that. If you want to have topics of this sort discussed by people that enjoy such matters, you will have to get the kind of people that enjoy them together. Why not try the thing out a little bit, and see if we couldn't organize just a small group that would care for such a paper?" Well, you know, once in a long time in men's careers, a suggestion like that will strike fire in the brains of others. I can't for the life of me say now whether it was Gorton or Geijsbeek or myself that made that suggestion. But anyhow all three of us were presently aflame with the new idea, and we talked it over for a few minutes, getting more and more interested, and we said, "Now, who is there here that could be relied on in this convention that would care for this thing?" And we speculated, and we picked on Gates, Lovejoy, W. D. Richardson, Bleininger, and two or three others,—eleven in number, and we gathered around the table that same night in a room now used as a drug-store and there we laid the plans for the AMERICAN CERAMIC SOCIETY.

As I say, we made our pilgrimage down to that shrine to-day. The shrine isn't much, but the inspiration which rose in us from the work we did there has been the keystone, I would say, in the lives of most of us.

I am telling you this little story, as I said in the beginning, that all of you newcomers into the SOCIETY, as well as the old members, may hear and know of the accidental—the almost accidental genesis of the organization.

Mr. Purdy, our efficient Secretary, has recently, in the monograph which he has gotten out in honor of this occasion, told the greater portion of this anecdote, but I wanted you to know it at first hand from those who actually participated in it.

Now, gentlemen, the characteristic of those first eleven men, and later the first twenty-two men, was the fact that they were idealists. The word "service," which is used so very frequently now in uplift organizations of all sorts, was not then in use. We didn't hear the word "service" in its common and frequent significance of today. We had no clubs or technical organizations which were stressing "service" at that time. But that little group of men saw a situation; they saw an old industry, a big industry, a fundamental industry. And they saw an industry standing low in the popular opinion; they saw an industry with very little progressiveness; they saw an industry with very little knowledge of its own problems. These men were acting individually. Most of them did not know each other well, some of them hardly at all. They did believe in the power of friendly coöperation. And as they associated themselves together, they soon believed in each other. Among them action begat action; faith begat faith. Action and faith move mountains. They believed, if the barriers of custom and suspicion should be broken down, and the real human being beneath could be approached, that the good in all these men in the clay industries would concur, and that there would be a greater future, as well as a happier present, for the clay industry, if this organization could unlock these old barriers. This little group of twenty-two men,—nine of us here to-night—did not and could not foresee what has happened; but they sensed very well that whatever happened would be in the direction of what has happened here.

(Professor Orton then turned to the newly elected officers.)

Now, you have been selected in the legal and constitutional manner, to take over the fortunes and guide the destinies of this great organization. In one sense your task is easier than that of your forebears, because your field is now defined and crystallized in the popular mind. In another sense, it's much more human, because the energies of these nineteen hundred men and women are so vast and so potential for good or for bad, that it's now a matter of national concern that this SOCIETY shall be well led. It did not matter much what the original twenty-two said or thought; they had no national status; but what this group says is a matter of national concern.

Now may I presume to say to you that there's just one key that will unlock the doors to all the difficulties that will arise in your behalf, and that key is the one which was forged by this little group,—the key of idealistic service, the unselfish desire to marshal your own forces and those for which you stand the chosen leaders for the betterment of your industry, for the betterment of this country, for the betterment of the human race. I believe that this cause is a holy cause. Our beloved SOCIETY has the same spirit exactly that animated the old Crusaders, as they sought for the Holy Grail. I will now read to you this induction pledge:

"The thing which marks one group of men as better than another is not their wealth, their culture, their skill. It is their spirit of coöperation, the ability and willingness to pool their energies unselfishly in the cause of human advancement. Recognizing the truth of this principle, do you now, in assuming the leadership of this splendid group of American scientists, accept your respective offices as a sacred trust, and

consecrate yourselves anew through service to this organization, to the broader service of mankind?"

The Officers-elect: I do.

Professor Orton: In virtue of the authority temporarily vested in me, I pronounce these men duly qualified and elected officers of this Association, and I extend the right hand of fellowship.

Mr. Greaves-Walker, President of the SOCIETY. (Applause.) Mr. R. D. Landrum, Vice-President of the SOCIETY. (Applause.) Mr. Purdy, the Secretary of the SOCIETY. (Applause.) Mr. Hursh, your Treasurer. (Applause.) Mr. Danielson, your newly elected member of the Board of Trustees. (Applause.)

Secretary Purdy: I should like to ask Mr. Salisbury and Mr. Howe to stand up with those here, that all may see those who are guiding the destinies of this association.

The Toastmaster, Mr. Barringer: Professor Orton, you have just stated, in sketching the origin of the SOCIETY, that one of your former pupils, Mr. Gorton, presented for the first time before the National Brick Makers' Association a technical paper, describing a series of experiments, using chemical formulae as the basis. Your students know that Gorton could not have presented that paper if it had not been for yourself. In your address this morning, you stated that character-building was the foundation of education. From the first class that entered your instruction in 1894, throughout the period of your teaching, I am sure that every one of your pupils has realized that you have been preëminently a teacher who has builded character.

I have here a book containing the letters of some fifty of your former pupils attempting to state their appreciation of what you have done for them, not by advice and instruction in the class-room only, but by the inspiring example of your character, of your being yourself, all that is worth while in life. There is one chap here who says that he saw the best side of Professor Orton, because he was a fellow in need. That student is not alone. I know a half dozen of them. I myself, as one of Professor Orton's pupils, was a "fellow in need," and I know that there's where his friendship and sympathy and encouragement shine to the best effect.

We have also gathered here the papers with reference to the placing of a portrait of Professor Orton in the Ceramic Building at Rutgers College.

What a different world this would be, gentlemen and ladies, if each one of us could influence the lives, and definitely know it, of at least fifty people. Professor Orton, I know you have touched the lives of hundreds. But here, as an appreciation of this group of fifty, we wish to present you with a collection of letters expressing, as best they can, their love for you and their heartfelt gratitude for what you have been to them. (Prolonged applause.)

Professor Orton: Mr. Chairman, you certainly couldn't expect any response to this. Something of this sort deprives one of the ordinary modes of communication. All I can say is that this book will remain my very dearest possession. (Applause.)

THE SILVER JUBILEE CONVENTION EXHIBIT OF CERAMIC PRODUCTS

The exhibit this year was larger, better, and covered a wider range than did the exhibit of 1922. The interest shown in this exhibit by the attending delegates and by local ceramists has established it as a feature of the annual conventions. A special committee will hereafter take the responsibility of organizing and caring for the exhibit.

Although the Art Division has, for the past two years, been through the difficulties of getting organized and of building up a program of service, it conceived and success-

fully carried into execution the exhibit of ceramic products. Rather than being a load, or to any degree adding to the responsibilities which the officers of this Division were assuming, they found that the exhibit assisted in attracting new membership support to their Division work and program. To Mr. Frederick H. Rhead belongs the credit of having established this instructive feature of our annual convention. He has given to it a large amount of time and, of greater value, the required executive and artistic ability so essential to the success of so ambitious an enterprise. To Mr. James C. Boudreau and Mr. H. S. Kirk, able collaborators with Mr. Rhead, is due a large share of the credit and praise for the success of the 1923 exhibit.

The following individuals and firms were the exhibitors:—

ART DIVISION

Arthur E. Baggs, Marblehead, Mass.
Newcomb Pottery, New Orleans, La.
Paul Revere Pottery, Boston, Mass.
Overbeck Pottery, Cambridge City, Ind.
Fulper Pottery, Flemington, N. J.
Russel Crooks, Boston, Mass.
Wahl Co., Chicago, Ill.
Munsell Color Company, New York City.
Frederick H. Rhead, Zanesville, Ohio
Mrs. Frederick H. Rhead, Zanesville, Ohio
Mrs. Bertha Riblet Pire, Wesleyville, Pa.
Miss May Elizabeth Cook, Columbus, Ohio
Rookwood Pottery Co., Cincinnati, Ohio

EDUCATIONAL EXHIBITS

The Carnegie Library, Pittsburgh, Pa.
Schenley High School, Pittsburgh, Pa.

ENAMEL DIVISION

Stanley Insulating Co., Great Barrington, Mass.
O'Hara Waltham Dial Company, Waltham, Mass.
The Elyria Enameled Products Co., Elyria, Ohio
The Vitro Manufacturing Co., Pittsburgh, Pa.
Vitreous Steel Products Co., Nappanee, Ind.

GLASS DIVISION

Corning Glass Works, Corning, N. Y.
Bausch & Lomb Optical Co., Rochester, N. Y.

HEAVY CLAY PRODUCTS DIVISION

Hydraulic Press Brick Co., Roseville, Ohio

REFRACTORIES DIVISION

Lavino Refractories Co., Philadelphia, Pa.
American Refractories Co., Joliet, Ill.
Mitchell Clay Manufacturing Co., St. Louis, Mo.
The Carborundum Co., Keasbey, N. J.
Charles Engelhard, Inc., New York City
Crescent Refractories Co., Curwensville, Pa.
Precision Grinding Wheel Company, Philadelphia, Pa.
Norton Company, Worcester, Mass.

TERRA COTTA DIVISION

Conkling-Armstrong Terra Cotta Co., Philadelphia, Pa.
Midland Terra Cotta Co., Chicago, Ill.
New York Architectural Terra Cotta Co., Long Island City, N. Y.

WHITE WARES DIVISION

Edwin M. Knowles China Co., Newell, W. Va.
The Mayer China Co., Beaver Falls, Pa.
Universal Sanitary Manufacturing Co., New Castle, Pa.
Hardinge & Co., Inc., New York City
Coors Porcelain Co., Golden, Colo.
The Homer Laughlin China Co., Newell, W. Va.
National Lime Association, Washington, D. C.
O'Brien & Fowler, Buckingham, Quebec, Can.
Saskatchewan Government and University, Saskatoon, Canada
Beaver Falls Art Tile Co., Beaver Falls, Pa.
The Roessler & Hasslacher Chemical Co., New York City.

THE WHITE WARES DIVISION

At the annual meeting of the White Wares Division, held in Pittsburgh, February 13 and 14, the following officers were chosen for the coming year:

Chairman................F. H. Riddle
Secretary.................C. C. Treischel

Chairmen of Committees and Representatives on Coördinating Service Council

Research......................F. K. Pence
Standards......................H. Spurrier on Specifications
George Sladek on Tests
Membership.................Ira E. Sproat
Rules.........................August Staudt
Ceramic Education............Geo. H. Brown
Data..........................C. C. Treischel
Nominating.................C. E. Jackson

In the work for the coming year the Division will concentrate on (1) A Classification for Feldspars, (2) Specifications and Classification for Flint and Whiting, (3) Coöperative Research on Saggers, (4) Researches on Domestic Ball Clays, (5) Researches on Kiln Firing, (6) The Ceramic Handbook.

Items (1) and (2) will be taken up by the Standards Committee which is to consist of ten members, six representing the consumers and four the producers. This Committee expects to hold three meetings during the year and hopes to develop a Classification that can be used as a basis for drawing up Specifications.

Item (3) will be handled by the Research Committee and their efforts will be directed toward a united effort on the part of the Bureau of Standards and the various Trade Associations of this Division.

Items (4) and (5) will be the basis for papers for the next annual meeting.

C. C. TREISCHEL, *Secretary*

PROPOSED AMENDMENTS TO THE CONSTITUTION

Article II, Section 5, to read

"Active Members must be persons competent to fill responsible positions in Ceramics. Only Associate Members shall be eligible to election as Active Members and such election shall occur automatically twenty-four months after acceptance as an Associate Member."

Article IV, Section 1, to read

"The affairs of the SOCIETY shall be managed by a Board of Trustees, consisting of the President, Vice-President, Treasurer, the two most recent past Presidents, and one trustee representative of each of the Divisions. The President, Vice-President and Treasurer shall be elected to serve one year. Each Trustee shall be elected to serve three years."

Article V, to read

NOMINATIONS AND ELECTIONS

(1) Nominating Committee. The Nominating Committee shall be composed of the two most recent past Presidents and one representative selected by each Division and by each Local Section. The Secretary of the SOCIETY shall be Chairman (without vote).

(2) Any ten Active Members may constitute a self-appointed Nominating Committee and present names of nominees for President, Vice-President, and Treasurer to the Secretary for placement on the election ballot, provided such names are presented at least thirty days before the annual meeting.

(3) Nominations for President, Vice-President, and Treasurer. The Nominating Committee shall, by majority letter vote, select nominees for President, Vice-President, and Treasurer.

(4) Nominations for Trustees. Each Division by plurality letter vote of the major members of the Division shall select a nominee for Trustee to serve for a period of three years, according to the schedule provided in Section X of the By-Laws.

The names of the nominees for Trustees thus chosen by the Divisions shall be transmitted to the Secretary of the SOCIETY (as ex officio Chairman of the Nominating Committee) not later than September first, and by him shall at once be transmitted to the members of the Nominating Committee, and shall be placed on the election ballot.

At least ninety days before the annual meeting the Secretary shall send the names of all nominees to each voting member of the SOCIETY.

(5) Election. The names of all nominees, provided their assent has been obtained before nomination, shall be placed upon a printed ballot in alphabetical order and shall be mailed to each voting member not in arrears at least twenty days before the annual meeting. The voting shall be confined to the names appearing on this ballot. The ballot shall be enclosed in an envelope on which there shall be no mark of identification other than the word "Ballot." The envelope shall be enclosed in another envelope for mailing, addressed to the Secretary, upon the back of which the voter shall endorse his name.

The envelopes and ballots shall be opened in the presence of three scrutineers appointed by the President, who will report the result of the election at the annual meeting.

A plurality of affirmative votes cast shall elect.

Article VII. Add following clause to the last sentence of Paragraph 1.

"—but for purpose of nominating for Division representative on the Board of Trustees each member must declare one and only one Division as his major Division, and he shall be designated as a major member of that Division."

Article XII. For the words "a regular meeting" substitute the words "the annual meeting" as provided in Section 1 of the By-Laws.

By-Laws. Section X.

To provide for rotation of the nominations of Trustees as representatives of the Divisions, as provided in Articles IV and V of the Constitution, some shall be nominated in 1923 to serve portions of the three-year terms as follows:

Terra Cotta to serve three years.
Enamels to serve one year.
Refractories to serve one year.

White Wares to serve two years.
Art to serve one year.
Heavy Clay Products to serve three years.
Glass to serve two years.

By-Laws. Section XI. Same as present Section X

BETWEEN SEASONS

The ski-jumping season was short and the record of membership work for March is shorter. Winter sports are over, spring sports are not yet in vogue, except the sports in the south and they aren't hunting for members. The list is fully as long as many a list of last year, but after the towering total reported last month it is a bit of a come-down. Our college professors rallied at the time of need, as they do so often, and A. S. Watts sent in two names, R. K. Hursh, two, C. W. Parmelee, two, J. B. Shaw, one, and D. A. Moulton, one. Karl Türk and L. R. Allison also sent in two each. The rest of the scoring was scattered, geographically and numerically. Illinois leads with seven, closely rivaled by Ohio with six. Maryland, New Jersey, and Pennsylvania each sent two representatives. Massachusetts, New Hampshire, Maine, Iowa, Indiana, New York, and Washington say "present" once each, as does Canada, while remarkably enough two members from Holland clattered over just in time to get listed.

The roll of workers follows:

	Personal		Personal
Gordon B. Wilkes	1	Charles A. Smith	1
D. A. Moulton	1	R. K. Hursh	2
A. S. Watts	2	Chas. E. Kraus	1
Joseph Keele	1	L. E. Barringer	1
B. T. Sweely	1	J. B. Shaw	1
L. R. Allison	2	C. W. Parmelee	2
W. A. Hull	1	G. Z. Minton	1
Karl Türk	2	H. S. Kirk	1
R. W. Hemphill	1	Office	7

Total 29

STATUS OF MEMBERSHIP

	Personal	Corporation
Status Jan. 12	1611	216
Dropped for non-payment of dues	21	1
	1590	215
Resigned	19	2
	1571	213
New Members received since Jan. 12	139	10
Status March 14	1710	223

The net increase therefore has been 99 personal and 7 corporation members. Resignations will be fewer for the remainder of the year and there will be no more dropped for non-payment of dues, since this act of swift justice occurs but once a year. There remain, therefore, 301 personal and 93 corporation memberships to be obtained in order to fulfil the hopes and plans of the budget. There are forty-one weeks left in 1923. There has been an average of five memberships a week received in the office of the Secretary, without any special effort by anyone so far as is known. Is there any reason why we cannot reach the necessary average of 7.31 personal members and 2.26 corporations every week. This means of course that many more must be received some weeks in order to cover the lean summer months when nobody joins anything except the lip and the cup of ice-water. Let's begin right away!

NEW MEMBERS RECEIVED FROM FEB. 11 TO MARCH 14, 1923

Bates, Oscar Kenneth, Room 4–145, Mass. Institute of Technology, Cambridge, Mass., Instructor of Physics.

Bruechert, Horace, 2826 West St., Ames, Iowa, Student, Iowa State College.

Campbell, John, Asbestos Wood Co., Nashua, N. H., Chemical Engineer.

Clawson, C. D., 1942 Iuka Ave., Columbus, Ohio, Student, Ohio State University.

Fréchette, Howells, Mines Branch, Dept. of Mines, Ottawa, Canada, Chief of Division of Ceramics and Road Materials.

Fusselbaugh, Reardon, 2028 Mt. Royal Ave., Baltimore, Md., Assistant Superintendent, Baltimore Enamel & Novelty Co.

Gallagher, Hugh S., Box 165, East Liverpool, Ohio, Vice-President, National Products Co.

Galvin, Gerald M., 2223 S. 18th St., Philadelphia, Pa., U. S. Navy Yard.

Gould, James, 1510 Electric St., Scranton, Pa., Superintendent, Scranton Enameling Co.

Hersey, Geo. F., Colonial Insulator Co., Akron, Ohio, Superintendent, Colonial Insulator Co.

Hobson, Stanley H., Geo. D. Roper Corp., Rockford, Ill., Director of Engineering.

Koenig, Franz J. M., Ivan Beirenstraat 12, Schoonhoven, Holland, Industrial Manager, Schoonhoven Pottery.

Legnard, W. M., 20 E. Jackson Blvd., Chicago, Ill., Vice-President, Interstate Clay Products Co.

Lucktenberg, Wm. H., Zanesville, Ohio, Vice-President, The Burton-Townsend Company.

Milliken, Edward C., 1892 N. High St., Columbus, Ohio, Student, Ohio State University.

Mundy, O. S., 905 W. Green St., Urbana, Ill., Student, University of Illinois.

Neiswanger, Samuel O., 107 S. 3rd St., Champaign, Ill., Student, University of Illinois.

Patch, Clifford, Bangor, Maine, Chemical Engineer, Orono Pulp & Paper Co.

Schoonenberg, Pancras, Library Dept., Philips' Glowlampworks, Eindhoven, Holland, Managing Engineer.

Scott, A. Lincoln, Auditorium Tower, Chicago, Ill., Research Engineer, American Hotels Association.

Tsou, We Wei, 76 W. Frambes Ave., Columbus, Ohio, Student, Ohio State University.

Vachuska, Edward J., Alfred, N. Y., Student, New York State School of Ceramics.

Watts, Orlando S., 629 Walnut St., Camden, N. J., President, Standard Enameling & Mfg. Co.

Weiskittel, Harry C., Jr., 4500 E. Lombard St., Baltimore, Md., Assistant Manager, A. Weiskittel & Son Co.

Whitehead, Fred, Foskett St., Trenton, N. J., Proprietor, Whitehead Pottery Co.

Williams, Glenn D., 836 N. County St., Waukegan, Ill., Ceramic Engineer, Chicago Hardware Foundry Co.

Wilson, J. A., 1001 South B St., Elwood Ind., Pittsburgh Plate Glass Co.

Worman, Eugenie A., 4809 Beach Drive, Seattle, Wash., Teacher of Pottery, University of Washington.

Wright, Edward P., Irwin, Ill., Student, University of Illinois.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Richard M. Balmert, formerly superintendent of the Lyth Tile Co. at Angola, N. Y., is now living at 1605 W. Lombard St., Baltimore, Md.

R. R. Danielson has recently affiliated himself with the Beaver Enameling Co. at Ellwood City, Pa. He is still connected with the Bureau of Standards and is in Washington part of the time.

M. C. Booze has been made Senior Fellow in Refractories at the Mellon Institute, Pittsburgh, taking the place of **R. M. Howe** who is now with the Kier Fire Brick Co.

E. A. Brockman and **A. C. Stepan,** of the Roessler and Hasslacher Chemical Co., may be found at the new offices of the company, 230 E. Ohio St., Chicago.

Sven Fogelberg, who was Assistant Director of the Kosta Glass Works, is now at the Hammars Glaswerk, Askersund, Sweden.

G. F. Bissell, of the Chicago Retort and Fire Brick Co., at Ottawa Ill., is now at the Chicago office of the firm.

Benjamin Alderson, who is connected with the American Bottle Co., has been transferred from Streator, Ill., to Newark, Ohio.

Victor W. Boeker, a student in the Ceramic Department of the University of Illinois, is now living at 1210 W. Illinois St., Urbana.

Charles J. Corty, superintendent of the American Foundry and Range Co., has moved from Arthur St. to 507 East A St., Belleville, Ill.

H. D. Callahan, with the National Fire Proofing Co., gives as his new address, 87 Maple Place, Keyport, N. J.

George Brain, for many years manager of the Universal Sanitary Mfg. Co., has recently taken a position with the Standard Sanitary Mfg. Co. at Tiffin, Ohio.

G. L. Rogers, of the Denny Renton Clay and Coal Co., has been transferred from Renton, Washington, to the Seattle office of the firm.

C. A. Underwood has been placed in the New York office of the American Refractories Co. at 120 Broadway, instead of at the Joliet, Illinois, plant.

G. W. Greenwood has changed his address from Wilkes-Barre to Dunbar, Pa.

NOTES AND NEWS

WHAT THE AMERICAN SOCIETY FOR TESTING MATERIALS HAS DONE IN CERAMICS

Papers Dealing with Clay Products

"A Machine for Testing Clay Products," by Mont Schuyler, Vol. XIV, Part II, p. 557 (1914).

"The Legal Interpretation of the Word 'Vitrified' as Applied to Ceramic Products," by Edward Orton, Jr., Vol. XV, Part II, p. 245 (1915).

"Comparison of Heat-Insulating Properties of Materials Used in Fire-Resistive Construction," by W. A. Hull, Vol. XVII, Part II, p. 422 (1917).

"Failure of a 30-in. Tile Drain at Albert Lea, Minnesota," by R. W. Crum, Vol. XVII, Part II, page 453 (1917).

"The Necessity for Inspection and Testing of Refractory Brick," by C. E. Nesbitt and M. L. Bell, Vol. XVIII, Part II, p. 336 (1918).

"Preventable Defects in Refractory Bricks," by C. E. Nesbitt and M. L. Bell, Vol. XIX, Part II, p. 619 (1919).

"Testing of Porosity of Electrical Porcelain," by W. D. A. Peaslee, Vol. XX, Part II, p. 495 (1920).

"Vital Factors in the Testing of Fire-Clay Refractories and in the Interpretation of Results," by R. M. Howe, Vol. XX, Part I, p. 278 (1920).

"A Study of the Proposed A.S.T.M. Tentative Specifications for Building Brick and a Correlation of Their Requirements with Sodium-Sulfate Treatment and Actual Freezing," by Edward Orton, Jr., Vol. XIX, Part I, p. 268 (1919).

"Practical Methods for Testing Refractory Fire Brick," by C. E. Nesbitt and M. L. Bell, Vol. XVI, Part II, p. 349 (1916).

"Testing of Refractories," by A. V. Bleininger, Vol. XIII, p. 967 (1913).

"Slag Test for Refractory Brick Used in the Iron and Steel Industry," by C. E. Nesbitt and M. L. Bell, Vol. XVII, Part I, p. 314 (1917).

"A Study of the Rattler Test for Paving Brick," by M. W. Blair and Edward Orton, Jr., Vol. XI, p. 776 (1911).

"Notes on Brick Pier Tests," by James E. Howard, Vol. VII, p. 475 (1907).

"Some Further Experiments upon the Absorption, Porosity and Specific Gravity of Building Brick," by D. E. Douty and L. L. Beebe, Vol. XI, p. 767 (1911).

"The Influence of the Absorptive Capacity of Brick upon the Adhesion of Mortar," by D. E. Douty and H. C. Gibson, Vol. VIII, p. 518 (1908).

"The Rattler Test for Paving Brick as a Safe Method of Disclosing the Limit of Permissible Absorption," by Edward Orton, Jr., Vol. V, p. 287 (1905).

"Standard Tests for Drain Tile and Sewer Pipe," by Anson Marston, Vol. XI, p. 833 (1911)

List of A.S.T.M. Standards and Tentative Standards Dealing with Ceramics

A.S.T.M. Standard Specifications for:

Paving Brick (C7–15)
Building Brick (C21–20)
Clay Sewer Pipe (C13–20)
Drain Tile (C4–21)

A.S.T.M. Standard Methods of:

Test for Refractory Materials under Load at High Temperatures (C16–20)
Test for Porosity and Permanent Volume Changes in Refractory Materials (C20–20)
Test for Softening Point of Fire-Clay Brick (C24–20)
Ultimate Chemical Analysis of Refractory Materials, including Chrome Ores and Chrome Brick (C18–21)

A.S.T.M. Standard Recommended Practice for:

Laying Sewer Pipe (C12–19)

A.S.T.M. Standard Definitions of:

Terms Relating to Sewer Pipe (C8–15)
Terms Relating to Clay Refractories (C27–20)

A.S.T.M. Tentative Specifications for:

Clay Sewer Brick (C23–21 T)
Required Safe Crushing Strengths of Sewer Pipe to Carry Loads from Ditch Filling (C15–17 R)
Clay Hollow Building Tile (C34–21 T)

A.S.T.M. Tentative Methods of:

Test for Slagging Action of Refractory Materials (C17–19 T)
Test for Resistance of Fire-Clay Brick to Spalling Action (C38–21 T)

A.S.T.M. Tentative Definitions of:

Terms Relating to Hollow Tile (C43–21 T)

GLASSWARE AND POTTERY EXHIBITS TO BE FEATURED IN NATIONAL EXPOSITION AT ATLANTIC CITY THIS SUMMER

The American Home and City Beautiful Association has recently issued an announcement outlining plans for a great Industrial American Exposition, to rival the greatest of those of the European countries, which will take place on the Million Dollar Pier, Atlantic City, N. J., from June 16 to September 8, 1923. The Exposition is arranged with a two-fold object of encouraging the use of articles of American manufacture and the education of the people of the United States in home and city beautification.

All of the exhibit floor space of the Million Dollar Pier—America's most attractive exhibition structure (in excess of 100,000 sq. ft.)—has been engaged for this exhibit, which will be devoted to eight principal groups with more than thirty allied classifications as follows:—Public and Private Buildings, materials, equipment, and furnishings; The Garden, seeds, accessories, and supplies; Art, Sculpture and Ornaments; Musical Instruments and Reproducers; The City Beautiful embracing Municipal Improvements, Hygiene, Sanitation, Accident and Fire Prevention; Pure Food Products, Confections and Beverages; Recreation, Athletics; Resort and Travel information, to boost "Seeing America First;" and an important section devoted to Radio.

Realizing the importance of the Glass and Pottery industry, as producers of essentials of practical utility and beauty in the home, the Exposition Management has set aside some of the most attractive sections of the Exposition to display and demonstrate the various kinds of Pottery, Glassware, China and Art novelties, and a varied assortment of household utilities.

Various trade organizations interested in the several branches of these industries as well as individual manufacturers and distributors will be prominently represented at the Exposition.

An Exposition folder giving full particulars regarding the exhibition will be mailed free to those who apply to the American Home and City Beautiful Exposition, Million Dollar Pier, Atlantic City, N. J.

LIST OF PUBLICATIONS OF CERAMIC INVESTIGATIONS, U. S. BUREAU OF MINES

Published in Outside Journals

"The Effect of Some Electrolytes on the Properties of Clays" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 1, No. 3, 1918.

"A Pycnometer Operated as a Volumeter" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 1, No. 8, 1918.

"The Properties of Some Ohio and Pennsylvania Stoneware Clays" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 1, No. 4, 1918.

"Fusibility of Graphite Ash and its Influence on the Refractoriness of Bond Clay" (M. C. Booze). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 1, Jan., 1919.

"Behavior under Brass Foundry Practice of Crucibles Containing Ceylon, Canadian, and Alabama Graphites" (R. T. Stull). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 3, March, 1919.

"Experiments in Dead-Burning Dolomite" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 4, April, 1919.

"Effect of Variable Pressure and Tar Content on the Briquetting of Alabama Graphite" (Stull and Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 5, 1919.

"Some Properties of Bond Clays for Graphite Crucibles" (M. C. Booze). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 6, 1919.

"The Effect of Electrolytes on the Properties of Graphite Crucible Bodies" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 6, 1919.

"A Machine for Testing the Hot Crushing Strength of Firebricks" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 8, Aug., 1919.

"The Position of Clay Products in the Field of Earthen Products" (R. T. Stull). *Brick and Clay Record*, March 6, 1919.

"Graphites and Bond Clays for Crucible Making Purposes" (R. T. Stull). *Proc. 22nd Am. Mining Congress*, p. 766, Nov. 17–21, 1919.

"The Need of Technical Assistance in the Brick Industry" (R. T. Stull). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 3, March, 1920.

"Government Service in Developing the Clay Industry" (R. T. Stull). *Clay Worker*, March 25, 1920.

"Elutriation Tests on American Kaolins" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 5, May, 1920.

"Behavior of Fire Brick in Malleable-Furnace Bungs" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 7, July, 1920.

"The Fusibility of Mixtures of Graphite Ash and Bond Clays" (R. N. Long). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 8, Aug., 1920.

"A Direct Reading Overflow Volumeter" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 9, Sept., 1920.

"Some Properties of Refractories" (R. T. Stull). *Proc. Electric Furnace Assoc.*, meeting at Columbus, O., Oct. 6, 1920.

"The Effect of Wet Grinding, Screening, and Electrolytes and Dextrine on Clays of Low Plasticity" (H. W. Douda). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 11, Nov., 1920.

"Experiments in Aventurine Glazes" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 12, Dec., 1920.

"Experiments in Dead-Burning Dolomite and Magnesite" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 4, No. 2, Feb., 1921.

"Some Properties of Bodies and Glazes Used in the Pottery Industry, together with notes on Lusters and Aventurine Glazes" (H. G. Schurecht). *New Jersey Ceramist*, Vol. 1, No. 1, March, 1921.

"Notes on the Effects of Firing Temperatures on the Strength of Fireclay and Stoneware Bodies" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 4, No. 5, May, 1921.

"The Separation of Lime from Dolomite" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 4, No. 7, July, 1921.

"Sedimentation as a Means of Classifying Extremely Fine Clay Particles" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 4, No. 10, Oct., 1921.

"The Degree to which Different Glaze Compositions Take Vapor Lusters" (R. T. Watkins). *Jour. Am. Ceram. Soc.*, Vol. 5, No. 1, Jan., 1922.

"The Microscopic Examination of the Mineral Constituents of Some American Kaolins" (H. G. Schurecht). *Bull. Am. Ceram. Soc.*, Vol. 5, No. 1, Jan., 1922.

"Mechanism of Plasticity from Colloid Standpoint" (G. A. Bole). *Jour. Am. Ceram. Soc.*, Vol. 5, No. 8, August, 1922.

"An Account of an Investigation of Some Georgia Clays and Bauxites" (Gilmore and Fessler). *Jour. Am. Ceram. Soc.*, Vol. 1, No. 5, Sept., 1922.

"A Simple Control Porosimeter" (G. A. Bole—F. G. Jackson). *Brick and Clay Record*, Vol. 61, No. 5, Sept. 5, 1922.

"The Mechanical Movement of Water through Clays and its Control" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 5, No. 12, Dec., 1922.

"Purification and Analysis of ZrO_2" (Jackson-Shaw). *Jour. Am. Chemical Soc.*, Dec., 1922.

"Note on Direct Reading Automatic Laboratory Scale for Weighing Briquettes" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 6, No. 3, March, 1923.

"Tests on Some Refractory Clays of California" (H. W. Douda). *Jour. Am. Ceram. Soc.*

"Dolomite Cements Involving the Sorel Reaction" (Stull and Schurecht). *Jour. Am. Ceram. Soc.*

"The Properties of Some Clay-Like Minerals of the Bentonite Type" (Schurecht and Douda). *Jour. Am. Ceram. Soc.*

"Coal Formation Clays of Ohio" (Stout, Stull, Demorest, McCaughey). *Ohio Geol. Survey Bulletin.*

"Permeability of Refractories to Air" (H. W. Douda). *Jour. Am. Ceram. Soc.*

"Preliminary Report on the Residual Kaolin and Feldspar in the Pacific Northwest" (H. Wilson, A. L. Bennett, and F. T. Heath). *Jour. Am. Ceram. Soc.*, Vol. 6, No. 3, March, 1923.

"Clays and Shales in the State of Washington, their Technology and Uses" (Hewitt Wilson). *State Bulletin*, Wash., 1922.

The above publications are usually available in large technical libraries, or can possibly be purchased by writing the publishers or book-dealers who specialize in the sale of back numbers of trade and technical journals.

Issued as a Publication of the Bureau of Mines

Bulletins

*Bulletin 53. "Mining and Treatment of Feldspar and Kaolin in the Southern Appalachian Region," by A. S. Watts. 1913. Out of print.

**Bulletin 71. "Fuller's Earth," by C. L. Parsons. 1913. 5 cents.

**Bulletin 92. "Feldspars of the New England and Northern Appalachian States," by A. S. Watts. 1916. 25 cents.

Bulletin 112. "Mining and Preparing Domestic Graphite for Crucible Use," by G. D. Dub and F. G. Moses. 1920.

Bulletin 128. "Refining and Utilization of Georgia Kaolins," by I. E. Sproat. 1916.

**Bulletin 160. "Rock Quarrying for Cement Manufacture," by Oliver Bowles. 1918. 25 cents.

TECHNICAL PAPERS

*Technical Paper 99. "Probable Effect of the War in Europe on the Ceramic Industries of the United States," by A. S. Watts. 1915. Out of print.

Technical Paper 126. "The Casting of Clay Wares," by T. G. McDougal. 1916.

**Technical Paper 155. "Gypsum Products, Their Manufacture and Uses," by R. W. Stone. 1917. 20 cents.

Technical Paper 203. "Labor Saving at Limestone Quarries," by Oliver Bowles. 1919.

Technical Paper 212. "The Determination of Combustible Matter in Silicate and Carbonate Rocks," by A. C. Fieldner, W. A. Selvig, and G. B. Taylor. 1919.

**Technical Paper 233. "The Properties of Some Stoneware Clays," by H. G. Schurecht. 1920. 10 cents.

Technical Paper 281. "The Use of Electrolytes in Purifying Clays," by H. G. Schurecht. 1922.

* Can be consulted at most public libraries.

** Obtainable only through the Superintendent of Documents, Government Printing Office, Washington, D. C., at the price indicated.

ELECTRIC FURNACE REFRACTORIES

In a general study of electric furnace refractories, being made by the Ceramic Experiment Station of the United States Bureau of Mines, Columbus, Ohio, conductivity tests are to be made of alundum, carborundum, sillimanite, spinel, silica, and magnesite.

COÖPERATIVE WORK ON REFRACTORIES

The Bureau of Mines laboratory car Holmes is now at the plant of the American Refractories Company in Baltimore where initiatory work on the coöperative investigation between the Refractories Manufacturers' Association and the Bureau has begun. The objects of this investigation are to decrease fuel consumption in burning refractories, to shorten the time of burning, and to improve the quality of the product.

This coöperation is conducted through a committee of the Refractories Manufacturers' Association, of which S. M. Kier of Pittsburgh is chairman. The car serves as laboratory and living quarters for the crew conducting the investigation, which consists of seven technical men, a cook and a mechanic's helper. The technical force consists of four ceramic engineers and three fuel engineers, all of whom have had experience on problems of this type. The ceramic men are E. P. Ogden, foreman in immediate charge of the work, Alfred Whitford, A. E. Rupp and A. H. Fessler. The fuel engineers are W. E. Rice, car manager, R. F. Lunger and F. Wentzel.

After about a month's stay at the Baltimore plant the car will go to six other plants situated at Brooklyn, N. Y.; Womelsdorf and Salina, Pa.; Hayward Station and Taylor, Ky.; and Ottawa, Ill.

This work is under the immediate supervision of G. A. Bole, superintendent of the Bureau of Mines Ceramic Station, Columbus, Ohio, the fuel and gas work being under the supervision of Mr. John Blizard, fuel engineer of the Pittsburgh station. Mr. Willard D. Richardson, kiln expert, is consultant.

The crew takes data and makes observations during the first test and assumes direction of the burning of the kiln on the second test.

Three conferences of the technical staff and advisors are held with the plant managers, the first one before the first burn, then following the first and before making the second burn, and after the data for both burns are assembled. This brings to the writing of the reports the very best available knowledge both of plant experience and general technical information, a coöperation of the plant and laboratory men that should bring out the largest amount of vital information bearing on kiln economics.

FACE BRICK TESTS OF GEORGIA CLAYS

There is in Georgia a great quantity of impure feldspars and pegmatites which are unfit for use as a pottery ingredient but which, it is hoped, will make satisfactory vitrified face brick when mixed with an appropriate amount of white clay and burned to a dense body. With this idea in mind test pieces have been made up at the Ceramic Experiment Station of the Bureau of Mines, using varying proportions of several different feldspars and clays. The test pieces will be burned at several different temperatures.

BULLETINS ISSUED BY THE DEPARTMENT OF CERAMIC ENGINEERING, UNIVERSITY OF ILLINOIS, URBANA, ILL.

1. Courses in Ceramics. U. of I. Bulletin, Vol. III, No. 3, Nov. 1, 1905. None available.
2. Part 1. Purdy, R. C. and Fox, H. B., "Fritted Glazes," 1907. 45 cents.
   Part 2. Purdy, R. C. and Krehbiel, J. F., "Crystalline Glazes," 1907. 45 cents.
3. Purdy, R. C. and Moore, J. K., "Pyrochemical and Physical Behavior of Clays," Vol. 4, No. 13, U. of I. Bulletin, Mar. 1, 1907. None available.
4. Jones, J. C., "Efflorescence of Brick," 1906. None available.
5. Circular of Department of Ceramic Engineering. None available.
6. Jones, J. C., "Effect of Repeated Freezing and Thawing on Brick Burned to Different Degrees of Hardness," 1907. 25 cents.
7. Bleininger, A. V. and Moore, J. K., "The Influence of Fluxes and Non-fluxes upon the Change in the Porosity and the Specific Gravity of Some Clays," 1908. None available.
8. Bleininger, A. V., "A Study of the Heat Distribution in Four Industrial Kilns," Vol. 5, Aug. 17, 1908. None available.
9. Stull, R. T., "A Cheap Enamel for Stoneware;" Bleininger, A. V., "The Viscosity of Clay Slips," "Note on Some Fusion Curves," 1908. None available.
10. Bleininger, A. V. and Layman, F. E., "A Method Making Possible the Utilization of an Illinois Joint Clay;" Bleininger, A. V., "An Attempt to Determine the Amount of Heat Utilized from a Down-draft Kiln by the Waste Heat Drying System," 1909. 5 cents.
11. Stull, R. T., "A Cheap Enamel for Stone-ware," Part 2, 1909. 10 cents.
12. Stull, R. T., "Notes on the Manufacture of Enamel Brick with Some Investigations on Enamel Brick Slips," 1909–10. 30 cents.
13. Bleininger, A. V. and Stull, R. T., "A Study of the Vitrification Range and Dielectric Behavior of Some Porcelains," 1909–10. 20 cents.
14. Stull, R. T. and Radcliffe, B. S., "Opalescence and the Function of Boric Acid in the Glaze," 1909–10. 5 cents.
15. Knote, J. M., "Some Chemical and Physical Changes in Clays Due to the Influence of Heat," 1909–10. 20 cents.

16. Stull, R. T. and Baldwin, G. H., "Cobalt Colors Other Than Blue;" Stull, R. T., "Influences of Variable Silica and Alumina on Porcelain Glazes of Constant RO;" Radcliffe, B. S., "Investigations on the Dielectric Strength of Some Porcelains," 1912. 20 cents.
17. Bleininger, A. V. and Fulton, C. E., "The Effects of Acids and Alkalies upon Clay in the Plastic State;" Hursh, R. K., "Note on the Relation Between Preheating Temperature and Volume Shrinkage;" Hursh, R. K., "Note on the Dissociation of Calcium Hydrate," 1912. 15 cents.
18. Bleininger, A. V. and Teetor, Paul, "A Thermal Study of Boric Acid-Silica Mixtures;" Brown, R. E., "The Replacement of Tin Oxide by Antimony Oxide in Enamels for Cast Iron." 15 cents.
19. Stull, R. T. and Williams, A. E., "Investigation on Iron Ore Cements," 1913–14. 10 cents.
20. Stull, R. T. and Hursh, R. K., "Designs of Seven Test Kilns." 5 cents.
21. Stull, R. T. and Howat, W. L., "Deformation Temperatures of some Porcelain Glazes;" Rand, C. C. and Schurecht, H. G., "A Type of Crystalline Glaze at Cone 3," 1913–1914. 10 cents.
22. Stull, R. T., "The Influence of Chlorides of Calcium and Iron when Precipitated in a Porcelain Body;" Radcliffe, B. S., "Some Cobalt-Uranium Colors," 1913–14. 10 cents.
23. Williams, A. E., "Notes on the Development of the Ruby Color in Glass," 1914. 10 cents.
24. Department of Ceramic Engineering, U. of I. Description of Dept. Courses, and Equipment. Free.
25. Washburn, E. W., "The Effect of Gravitation upon the Drying of Ceramic Ware," 1918. 10 cents.
26. Hursh, R. K., "Heat Balance on a Producer Gas Fired Chamber Kiln," 1918. 5 cents.
27. Washburn, E. W., "The Furnace Atmosphere as a Source of Color in the Manufacture of Optical Glass," 1918. 5 cents.
28. Parmelee, C. W., "An Unusual Cause of Spalling of Sewer Pipe." 5 cents.
29. Washburn, E. W., "The Latent Heats of Fusion of Lime and Magnesia." 25 cents.
30. Washburn, E. W., "Some Aspects of Scientific Research in Relation to the Glass Industry." 15 cents.
31. Washburn, E. W., "Note on the Latent Heat of Fusion of Cristobalite." 5 cents.
32. Washburn, E. W., "Refractory Materials as a Field for Research." 30 cents. None available.
33. Washburn, E. W., "The Ceramic Industries. New Opportunities for the Technical Man in the World's Most Ancient Industries," 1920. No Charge.
34. Washburn, E. W., "Physical Chemistry and Technology," 1920. 10 cents.
35. Washburn, E. W. and Libman, E. E., "An Approximate Determination of the Melting-Point Diagram of the System Zirconia Silica," 1920. 15 cents.
36. Washburn, E. W., "A Factory Method for Measuring the Viscosity of Pot Made Glass During the Process of Manufacture. Together With Some Discussion of the Value of Viscosity Data to the Manufacturer," 1920. 20 cents
37. Washburn, E. W., F. F. Footitt, E. N. Bunting, "Dissolved Gases in Glass," 1921. Free.
38. Washburn, E. W., "The Dynamics of Capillary Flow," 1921. 15 cents.
39. Washburn, E. W., Navias, L., "The Products of the Calcination of Flint and Chalcedony," 1922.

40. Washburn, E. W., Footitt, F. F., Bunting, E. N., "Porosity Reprints," 1922. 35 cents.
41. Washburn, E. W., Parmelee, C. W., Hursh, R. K., "Selected Bibliography of Books in the English Language Dealing with Ceramics," 1921. 20 cents.
42. Washburn, E. W., "Physical Chemistry and Ceramics." 20 cents.
43. Parmelee, C. W., "Effect of Sulfur in Coal Used in the Ceramic Industries," 1919. 10 cents.
44. Parmelee, C. W., "Soluble Salts and Clay Wares," 1922. 5 cents.
45. Libman, E. E., "Some Properties of Zinc Oxide Bodies," 1922. 5 cents.
46. Washburn, E. W., Navias, L., "Relation of Chalcedony to the Other Forms of Silica," 1922.
47. Washburn, E. W., Oldfather, W. A., "Etymology of the Word Ceramics."
48. Parmelee, C. W., "Refractory Clays of Illinois," 1922.

CALENDAR OF CONVENTIONS

American Association of Flint and Lime Glass Mfrs.—April, 1923.
American Dental Trade Association—Spring Lake, N. J., June, 1923.
American Face Brick Association—First Week in December, 1923.
American Face Brick Association, Southern Group—West Baden, Ind., November, 1923.
American Foundrymen's Association—Cleveland, Ohio, April 30–May 3, 1923.
American Gas Association—October, 1923.
American Hotel Association of United States and Canada—San Francisco, April, 1923.
American Society for Testing Materials—Place not determined, June, 1923.
American Zinc Institute—St. Louis, Mo., May 7 and 8, 1923.
Association of Scientific Apparatus Makers of the United States of America—Washington, D. C., April 20, 1923.
Chamber of Commerce of the United States of America—New York City, May 8–10, 1923.
Clay Products' Association—Chicago, Ill., Third Tuesday in each month.
Dental Manufacturers' Club of the United States—Spring Lake, N. J., June, 1923.
Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18, 1923.
Manufacturing Chemists' Association—New York, June, 1923.
National Association of Manufacturers of the United States—New York City, Week of May 14, 1923.
National Association of Stove Manufacturers—Richmond, Va., May 9, 1923.
National Association of Window Glass Manufacturers—Place and date not determined
National Board of Fire Underwriters—New York, May 24, 1923.
National Bottle Manufacturers' Association—Atlantic City, N. J., Last of April, 1923.
National Gas Appliance Manufacturers' Exchange—Kansas City, Mo., May, 1923.
National Gas Association of America—Louisville, Ky., April 23–24, 1923.
National Paving Brick Manufacturers' Association, December, 1923.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Stoker Manufacturers' Association—May or June, 1923.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

Vol. 2 May, 1923 No. 5

EDITORIAL

EQUIPMENT MANUFACTURERS AND MATERIAL PRODUCERS ARE RESEARCH ENGINEERS

Salesmen of ceramic materials and equipment have been styled ambassadors. They are representatives from one concern sent to another in the interest of the welfare of both. They are selling goods, hence cultivating a market for them, but the highest type of the present day salesman does more than that; he gives honest service.

The factory or house which the salesman represents has studied the requirements of the most efficient plant control and manufacturing, has devised machines, instruments, and methods, and has trained its sales representatives to demonstrate them.

The goods they sell were devised to meet a requirement rather than a demand; the demand is created by demonstration.

The inventing of a machine, device or instrument and the preparation of a material is based on a series of technical researches and the pyramiding of experiences. No machine or apparatus will find a continued sale that does not contain the most serviceable material known and which has not the proportion and design which will most effectively meet the requirements of ceramic manufacturing. The selection of the proper materials, proportions and designs requires a search through the world's accumulation of knowledge, an ability to select that which applies, and then to fabricate from the knowledge thus selected and marshalled an apparatus that will serve a given purpose.

The successful and progressive equipment manufacturer must be a research engineer with a genius for seeing the utilitarian possibilities of the bits of abstract knowledge discovered by the fundamental scientists, and he must have the ability to devise and to build them into a serviceable apparatus. The manufacturers of ceramic equipment and devices and those who find and prepare materials for use in the manufacture of ceramic wares are ceramic engineers who serve the ceramic industries just as effectively as do the ceramic engineers who are directly employed in manufacturing ceramic wares.

The fundamental scientists analyze for the purpose of finding the ultimate properties of substances singly and in combination. They are not concerned with the utilitarian possibilities of the facts they disclose. They are analysts.

Inventors are those who see the utilitarian possibilities of the facts which are disclosed by the scientist and who have the ability to create a process or equipment embodying the fundamental facts of the scientists. Synthesis is the opposite of analysis. Analysis is the taking apart and synthesis is the putting together. Inventors are our synthetic engineers.

Inventing and building are but one of the problems of the equipment manufacturer. The equipment must be installed and operated and the material must be used as a constituent in a mix. Here is where the sales ambassadors serve both the producer and the user of ceramic materials and equipment.

There are patented kilns, dryers, gas producers, furnaces, leers, pyrometers, etc., which have proven to be of economic value to ceramic manufacturers but it could hardly be expected that any one device will be equally successful under all conditions. It is rare indeed that a device does not have to be adapted to a condition. This is where the service of the sales ambassadors comes in.

The equipment manufacturer is seeking a market for that in which he has invested a large amount of time and money in construction research, and the ceramic manufacturer is seeking equipment, processes and materials that will enable him to manufacture at less cost with no deterioration in quality of ware. The equipment and material producer employs sales demonstrators and sends them to the ceramic manufacturers. He pays for space in journals wherein he aims to tell the ceramic manufacturer the advantage of using his equipment or material. This he does for his own profit but if there ever was a group of manufacturers of whom it can truly be said that "he profits most who serves best" it is the manufacturers of equipment and the producers of raw materials.

This editorial is an argument for a larger use by ceramic manufacturers of the services of the producers of equipment and materials, to study with them in an intimate fashion the problems of ceramic production, for thus

will both the producer and user of equipment and materials discover that which will be the most economical.

For legal problems a lawyer is employed; for medical problems a doctor is employed, for power problems a power engineer is employed; for chemical problems a chemist is employed. Such experts as these are paid salaries or fees. Why is it not logical to employ equipment engineers on equipment problems? Is it because they do not charge a fee unless their equipment is purchased? A study of the catalogs and advertisements of equipment producers will be without cost but it will be productive of new ideas and facts which can be profitably applied. A letter will bring a consulting service without further cost.

The equipment and material producers are ceramic engineers worthy of hire at their own terms.

PAPERS AND DISCUSSIONS

ZIRCONIA IN SHEET IRON ENAMELS[1]

By W. F. Wenning

Zirconia means zirconium oxide. Zirconium, as far as we know, is one of the elements that composes the earth. Its *chemical and physical* properties make it a desirable ingredient for ceramic products. Investigation and research have yet left a large field incomplete *for the unlimited use of zirconia* in ceramic products.

The largest deposits of zirconia have been found in South America. The deposits in this region are so vast it would compensate further research in its applicability to ceramic products.

The difficulty of transporting the ore from the field to the sea port has really made it one of the rare earth elements. From ten to fifteen pairs of oxen are required in carrying a single ton of ore over the almost inaccessible mountain road. Baddeleyite is the chief mineral of this ore whose composition varies as follows: Zirconium oxide, 75 to 94%; titanium oxide, 1 to 3%; iron oxide, 2 to 4%; silica, 10 to 20%; alumina, 1 to 4%.

This material, despite being one of the hardest substances known is pulverized to a very fine powder. This powder has a light yellowish brown appearance and can be used in enamels in this form. Most of the iron can be removed from the ore by prolonged acid digestion. This *almost iron free material* has the appearance of a light gray powder, but its composition is not otherwise changed. After this first step in refining it may be used in enamels where iron is an undesirable constituent. White chemically pure zirconia is the ultimate refined product. It may be used to obtain the desirable properties of zirconia in enamels, but its cost prohibits its commercial use. Similar properties in enamels have been effected by the use of the so-called white technical amorphous zirconia.

The composition of white technical zirconia depends on its process of manufacturing. Most specimens retain the titanium oxide, a small percentage of silica and traces of iron; while others contain small percentages of sodium and potassium oxides.

Brown and gray zirconia were adapted, respectively, to ground coat and gray mottled enamel. The smelting process of these enamels makes it possible to thoroughly dissolve the zirconia; while for white enamels it was found that white zirconia was the only form suitable as a batch ingredient. The amorphous property of the white powder caused it to be uniformly distributed if not dissolved by the smelting process.

The brown zirconia used in ground coat enamels exhibited no ill effect because of its iron content, while the high percentage of zirconium oxide in the brown zirconia displayed *its* properties sufficiently. Zirconia having

[1] Presented before the Enamel Division, Pittsburgh meeting, February, 1923.

properties similar to alumina and silica was used in place of these ingredients in ordinary ground coat enamels. A replacement up to ten per cent by zirconia in the batch changes the working property of the enamels very little, while high replacements rendered the enamel very viscous and difficult to smelt down. Enamels containing up to ten per cent zirconia were more elastic and tested to be stronger enamels with better adhesion to the steel.

Without changing the original batch formula, but adding from one to five per cent zirconia to the mill formula, the fish-scaling tendency was reduced and in one enamel crazing was overcome. Pinholes in ground coats which show up through the white cover coats are caused chiefly by impurities in sheet iron. A ground coat that ordinarily was giving good results was changed by the addition of two per cent brown zirconia to the mill formula. The pinhole defects were markedly reduced; gases or other impurities were allowed to escape or were absorbed by the zirconia.

The gray almost iron free zirconia was used and tested in gray mottled ware enamels because its low iron content did not discolor the enamel. Zirconia was also partially substituted for alumina and silica. Stronger and lighter colored enamels which showed less fish scaling were produced. Substitutions were also made for bone ash and antimony. The color through these substitutions was little affected. The enamel in which zirconia replaced the bone ash was changed after its application on the metal to a slightly darker color and the blister and rust spot tendency of bone ash enamels was eliminated. Substitutions for antimony made no change in color, but the fusibility or melting point of this enamel was slightly increased. High zirconia substitutions for silica and alumina in the gray enamel while making the color lighter had a slight tendency to produce a sunken mottle. Although the enamel so produced was not quite so smooth as the unchanged enamel its resistance to acids and heat and mechanical shock was markedly improved.

With all its other virtues, zirconia has its chief virtue in its opacifying property. This property, however, was not directly obtainable from previously mentioned brown and gray zirconia. The white amorphous powder alone was the one which could be matched against other opacifying ingredients. It was used as a batch ingredient to replace silica, alumina, zinc oxide, antimony oxide, tin oxide, and phosphates. The enamels so changed were whiter and more opaque. These same enamels when used with tin oxide in the mill formula were also whiter and more opaque and more glossy than the original enamels. Enamels in which zirconia was used in the mill formula were whiter and their opacity approached very closely to those in which tin oxide was used in the mill formula.

Zirconia used in mill formulae of low fluoride enamels produced exceptionally good opacity and whiteness. Such enamels are more acid resistant because of their low fluoride content and the added zirconium oxide.

In addition to the opacifying property of zirconia it may be summarized that enamels containing zirconia are more resistant to mechanical and thermal shock; they are more acid resistant and the zirconia in these enamels is not affected by reducing furnace heat.

Ceramic Laboratory
Vitro Mfg. Co.
Pittsburgh, Pa. U. S. A.

PRICING AND COSTING GRADED PRODUCT[1]

By Norman E. Webster

In many kinds of manufacturing, mining, agriculture and other industries, the product from the same or identical operations is of varying degrees of excellence as measured by standard specifications. The differences between the grades may be in quality, in size, or in some other condition. Manufactured goods and agricultural products are often graded for quality; coal and other mining products for size. In each industry experience shows the proportions of each grade that are ordinarily obtained. Fortunately, it is usually possible, as it is always desirable, to obtain a market for the entire output, and to have the demand so balanced that the output of each grade can be regularly sold in about the proportions in which it is ordinarily produced.

In these cases the producer is confronted with the problems of price-fixing, in so far as that is within his power, and of ascertaining the costs of production as a basis for the fixing of prices or for comparison with the prices which are obtainable. The purpose of this discussion is to consider the problem of costing graded product, and to show its relation to the problem of pricing the different grades.

Two other classes of salable material should not be confused with graded product; *viz.*, scrap and by-products. Scrap is the salvaged material resulting from manufacturing processes which cannot be fabricated into the regular product without again being put through one or more of the processes to which the raw material is subjected, and when it has a market value, the net amount received for it should be deducted from the expenditure for the raw material used in the product. By-products are side lines of production in which are used residual materials resulting from the production of the principal lines. These residuals usually require further work to make them salable, and the expenditures therefor should be deducted from the selling prices to obtain the net proceeds, which amounts should be deducted from the departmental costs for materials, labor, and expenses of the regular product.

Graded product differs from scrap and from by-products in that all of

[1] Read and discussed before the Glass Division, Pittsburgh meeting, February, 1923.

it has been the object of all the productive operations. It is all regular product, though the several classes have different values, varying according to the demand for each.

In pricing different grades of product, consideration should be given to the questions of demand and of the effect which the price on one grade will have on the demand and the obtainable price for the others. Where the product is a necessity for which there is a universal demand, the prices should be so adjusted as to create demands for each class in quantities approximately equal to the quantities produced, and so that the average selling price for all classes will give a proper rate of net profit over the average production costs.

But there are other considerations to be taken into account in fixing selling prices on graded product of articles which are not necessities and for which there is not a universal demand. Manufacturers' seconds in many lines require this careful attention. The bulk of the output is usually of the first or standard grade, and in order not to unsettle the market conditions on this grade, or to cheapen the value of a trade name, it may be better policy to scrap all product not of the standard grade, or to offer the seconds at prices which will not sell all of them. In such cases, the standard grade should be priced so as to yield a proper rate of profit on the expenditure for all the product of both grades. Then if it is advisable to scrap the seconds, or to salvage the material in them, the entire line will still show the desired profit, while if a part or all of the seconds are sold, the amount and rate of profit will be correspondingly increased.

In addition to these questions of policy involved in the pricing of graded product, the costing of the different classes raises about as many accounting questions, the solution of which is necessary in order that the costs may be compared with the selling prices and thereby help to solve the questions of policy involved in pricing. Commonplace as it may sound, it seems necessary to reiterate that pricing and costing should go hand in hand.

Three methods of costing may be considered: First, that the cost is the same for each unit in all classes of the product, based on the theory that the same amounts for material and labor have been expended on each. Secondly, that the cost of each unit of the seconds is only the value of the scrap material therein, and that the remaining expenditure should be absorbed in the costs of the firsts, based on the theory that the expenditures were all made to obtain the firsts. Thirdly, that the costs of the units in each class include unequal parts of the expenditures, based on the theory that quality as well as quantity should be considered in measuring or reckoning the product, and that, therefore, units of identical dimensions or weights, but of unequal qualities, have not received equal benefit from the expenditures made for their processing.

For the purpose of considering the soundness of each of these methods of costing the product, the following illustration may be taken: Assume that a mill run of some article consists of 100 units, that 60 are firsts because they fully conform to inspection specifications, that 30 are salable seconds, and that 10 are unmarketable rejections. Assume also that the expenditures for this quantity are $20.00 for material and $80.00 for labor and overheads, that the realizable selling prices are $2.00 each for the firsts, and $1.00 each for the seconds, and that there is a salvage value of 10 cents each in the material in the 10 rejections. The account for this run exclusive of selling and general expenses will then be as follows:

Sales:			
Firsts, 60 units @ $2.00		$120.00	
Seconds, 30 units @ $1.00		30.00	
			$150.00
Cost of Sales:			
Material for 100 units:			
100 units @ $0.20	$20.00		
Less scrap:			
10 units @ $0.10	1.00		
		19.00	
Labor and Overheads		80.00	
			99.00
Manufacturing Profit (51.5% on Cost)			$51.00

The following gives a comparison of the results per unit by each of the first two methods of costing the product, losses being indicated by an asterisk after the amount or percentage:

Method	Grade	Price each	Cost each	Profit each	Total profit	% Profit on cost
First,	60-1sts	$2.00	1.10	0.90	54.00	81.8
	30-2nds	1.00	1.10	0.10*	3.00*	9.1*
Second,	60-1sts	2.00	1.60	0.40	24.00	25
	30-2nds	1.00	0.10	0.90	27.00	900

In examining the results of the first method, we should remember that the aim is to produce the greatest possible proportion of units of the first or standard grade, and that business policy might make it inadvisable to market any seconds. In that case, the total expenditures less the salvage value of the materials in the 30 seconds and the 10 rejections, or a net amount of $96.00, would be charged to the production of 60 firsts, making the cost $1.60 each, but although the comparative table shows that, by the first method of costing, there is a profit on the firsts of 81.8% on cost, the total profit of $51.00 can only be secured by selling all of the seconds at a loss of 9.1% on cost. Profits are not made out of losses in that way, and the first method is therefore unsound in economics.

The second method results in showing a profit on the firsts of 25% on cost, and this is not dependent upon the sale of the seconds. By this method, the cost of the seconds is computed at only the salvage value of the material in them, and yet the price obtained is largely in excess of the salvage value. The reason is that in addition to the material, the seconds possess value as a result of the labor and overheads which have been expended. Having received a portion of the benefit, they should be charged with a proper proportion of the expenditures and not be relieved of them as are the rejections which have not been so benefited.

The error in the first method is in not distinguishing between expenditures and costs. Expenditures are an element of costs of which the other factor is product. By assuming that expenditures are identical with costs, the former would have to be permanently allocated to each article as the material was set apart for it and the labor was applied to it, and this would result in making each of the ten rejections cost the same as each of the firsts and seconds. The error in the second method is in not recognizing that in the production processes the seconds received some of the benefits of the expenditures for labor and overheads, though in less degree than the firsts.

The third method is based on the varying degrees of benefit applied to the different grades of the product. What these are cannot be ascertained during the manufacturing processes. They are not subject to count, or to measurement by the yard stick, peck measure or scales. But they are measurable in another way which is by the prices at which the different grades can be sold. These prices provide a basis for converting the quantities of all grades into some common standard which, for convenience, should be that of the first or standard grade. Each second is equal in quantity to that fraction of a first which is represented by the price of the second divided by the price of the first.

Applying this method to the illustration already used, the result is as follows:

Method	Grade	Price each	Cost each	Profit each	Total profit	% Profit on cost
Third,	60-1sts	$2.00	1.32	0.68	40.80	51.5
	30-2nds	1.00	0.66	0.34	10.20	51.5

This method, therefore, shows 51.5% profit on both the firsts and the seconds; that is, the average rate for the entire mill run as shown in the original statement of the transaction. If now, after thus costing the two grades of product, it is found that not all the seconds can be sold at the proposed price, or if it is considered inadvisable to market them all, then the average rate of profit will be reduced pro rata, depending upon the number of the seconds that are scrapped. Thus, instead of 51.5% profit when all seconds are sold, the rate will be 42.9% if ten seconds are scrapped, 34.2% if twenty seconds are scrapped, and 25% if none of the seconds

are sold, this being the lowest rate of profit that the run can show if all the firsts are sold at the regular price of $2.00.

Properly computed costs on graded product are helpful to the executive in determining manufacturing and sales policies, while costs computed on erroneous bases of distribution may lead to the unsettling of market conditions if not to more serious consequences.

Niles and Niles, Certified Public Accountants
111 Broadway
N. Y. City

DISCUSSION

Chairman Hostetter:—As one gets into production and realizes the ramification of expenditures and costs it seems hopeless at times to know whether a new process is a success or not.

E. W. Washburn:—I would like to ask a question in regard to a point which the paper did not touch upon, that is the cost of process development. Are there any principles which are worked out for handling this cost, as to the number of years it is spread over and so forth?

N. E. Webster:—You mean the development of a process prior to the stage where it produces a marketable product?

E. W. Washburn:—Yes.

N. E. Webster:—That is one of the many phases of cost accounting which were not even touched upon in the paper on costing graded product. Development work may be done for the purpose of producing a patentable mechanism or process or formula. It may be done for the purpose of devising equipment or methods which will not be patentable but which through secrecy or otherwise can be temporarily reserved for the benefit of those who developed it. The development work may all be prior in time to the use of the resulting process, or it may be carried on for a considerable time and the results may be utilized in the current productive operations.

Every live progressive organization will try to improve methods and to obtain immediate benefit from the improvements made. The expenditures for the ordinary development work of that kind may not be susceptible of segregation from the purely operating expenses, and inasmuch as they are usually not large in proportion, they should be included in the current costs. Each period benefits from the results of the expenditures made during earlier periods and pays for such benefits by its contributions toward the future.

However, if the development work is not the ordinary improvements but the process is to be completely developed before it is used in production, the expenditures should be excluded from the current costs and should be treated as deferred charges, which may at once be written off against

the surplus or may be carried on the balance sheet as suspense items. Later when the development work is completed and the process is shown to be successful, the suspense items may be transferred to the capital assets if the process is secured by patent protection or they may be treated as deferred charges for absorption in the subsequent costs during a stated period which should be a conservative estimate of the time during which benefits will be derived from the process.

E. W. WASHBURN:—Are there any principles for determining over what period of years amortization should be applied?

N. E. WEBSTER:—Each case should be studied separately. However, if there is patent protection for the use of the process, the period may be for seventeen years. If the usefulness of the process is limited to a shorter period by contract arrangements or by anticipated progress of the art which may make the process obsolete, the period for amortization should be shortened accordingly. If the process is not protected by patent, the period for amortization should not extend beyond the earliest date when it may cease to be of value in the productive operations. There is no standard rule except that the treatment should be conservative so as to avoid carrying deferred charges on the balance sheet after they have become valueless to the business.

NOTES ON BURNING REFRACTORIES WITH SPECIAL REFERENCE TO THE CONTROL OF LABOR COSTS[1]

BY L. C. HEWITT

ABSTRACT

The tunnel kiln represents up-to-date practice. It is often possible, however, to greatly increase the efficiency of present equipment by keeping in mind the importance of such factors as the setting of dry ware, regular inspection of underground flues, provision for ample grate and flue area, use of burning records, study of vitrification curve, etc.

While the above factors are treated rather generally, more specific reference is made to the control of labor costs through the bonus system. A theoretical problem is worked out to show how the bonus system is applied and in what manner it benefits the employer and employee.

Introduction

Object in Burning.—In burning refractories, high quality ware is, of course, the paramount object to be secured, whether it is kiln design, burning schedule, kind of coal, type of setting, or whatever the particular burning phase may be that is up for consideration. The next object is to obtain this high quality ware at the lowest possible cost.

Tunnel Kiln up-to-date Method.—While the tunnel kiln is, no doubt, soon to come to the front as the most efficient method of burning certain

[1] Presented before the Refractories Division, Pittsburgh meeting, February, 1923.

types of refractories, due to nicety of control, reduced firing labor and handling costs, lower fuel consumption, quick turnover, and higher percentage of first quality ware that such a unit carries with it, it is to be recognized that there is to be no sudden change from present equipment over to this up-to-date method. Production must be continued during such a transition and such factors as plant layout, financial situation, etc., may make a change from present burning equipment in some plants practically prohibitive.

Increased Efficiency Possible with Present Equipment.—It is ofttimes the case, however, that it is possible to obtain greatly increased efficiency from the present equipment through slight changes in design, method of firing, type of setting, etc.

Inasmuch as the control of burning labor is the chief object of this paper, only brief mention will be made of other factors having an important bearing on increased burning efficiency. It is assumed that this industry, as a whole, is largely equipped with some form of the down-draft periodical kiln. While these other factors that will be mentioned are generally known, some of them are often overlooked in the daily routine of plant operation.

General Factors Having Bearing on Burning Efficiency

Set Dry Ware.—It cannot be emphasized too strongly that ware should be dry when it is set. Wet ware means longer burning time, with the tying up of costly equipment and it is often attendant with a lower quality product. It is very seldom that the kiln is an efficient dryer.

Inspect Flues Regularly.—Another important factor, which is often overlooked, is the provision of regular inspection of the underground flues and ducts. It takes draft to burn a kiln and up to a certain limit we can almost safely assume that the burning time is proportionate to the draft. This is particularly true in the water smoking stage, when the entire object is to relieve the ware of its moisture content. Fallen brick from the flue arch, the collection of setting sand, etc., reduces the flue area and hence the draft.

Size of Stack Flue Important.—The size of the flues connecting kiln and stack should also be carefully measured and compared to the area of the kiln bottom flues which feed them, for the effective flue area is no greater than the neck of the bottle in the circuit. The cost of tearing up and enlarging the stack flue is often very small in comparison to the benefits to be derived. Get them too large rather than too small; it takes only a minute to lower the stack damper if the draft is too strong.

Kiln Design.—A discussion of kiln bottom design, type of grates, etc., are subjects which cannot be properly treated in a general discussion. In brief, here again, the grate area should be too large rather than too

small and care should be taken in the floor design that the draft will be evenly balanced. The writer favors some type of so-called open bottom.

Burning Schedule and Records.—The pyrometer is, of course, an invaluable aid in working out and controlling the burning schedule. The vitrification curve of the particular fire clay used can also be employed to good advantage in this problem. If the shrinkage and porosity curve shows that there is little change in the clay over a rather wide range in temperature, and if ware can be secured which possesses the necessary strength, etc., by burning to a lower point of the curve in which the vitrification has been stabilized, often times considerable fuel and labor can be saved by thus limiting the vitrification period. Again, the vitrification curve may show that the burning is not being brought along to the extent that it should in order to relieve the ware of its fire shrinkage.

It is also well recognized that detailed records should be kept of each and every burn so that an analysis may be made of the factors which are conducive to high quality ware at low cost.

Controlling Labor Costs.—Passing on from these general notes, a more detailed reference will be made to the control of firing labor, it having been the writer's good fortune to have spent several months in working on this particular phase of burning in conjunction with Dwight T. Farnham, Industrial Engineer. The January 25th issue of *Brick and Clay Record* of 1921 contained an article by the writer on "Putting the Kiln Firemen on Bonus." Since the Program Committee of the Refractories Division were desirous of presenting a symposium of burning refractories at this time, and since the publications of the Society do not treat in detail this particular method of controlling burning labor, the *Brick and Clay Record* have kindly assented to the use of the subject matter of that article in this discussion.

Putting the Kiln Firemen on Bonus

Time Study Basis of Labor Standardization.—In working out a bonus system, there must be labor standardization and to standardize properly labor, time or motion study must be employed. Briefly speaking, time study consists of analyzing a job, breaking it up into its component parts, determining the time necessary for the accomplishment of each element, and then combining the results; unnecessary movements are brought to light and methods at once suggest themselves for increasing the efficiency of the task.

Benefits Derived from Bonus System.—But what is to be gained by this so-called time study and labor standardization? The answer is mutual benefits to employer and employee. The employee increases his earnings by receiving a bonus, while the employer increases his profits through more efficient operation.

Working out the Bonus System: Theoretical Problem

Kind of Kilns.—Turning to the method of putting the kiln fireman on bonus—let us first take a walk through the factory; let us assume that we find the yard equipped with nine kilns, six of which are of the round down-draft type and three of which are of the rectangular down-draft type, and that in respect to fire holes we find them classified as outlined in Table I. It is concerning these facts of which we first wish to inform ourselves, since the labor required for firing a certain kiln is dependent upon the number of fire holes. That is granting that the fire holes are evenly spaced, of the same size and kind, it will obviously take twice as long to fire ten fire holes as it will five, etc.

TABLE I

KILN CLASSIFICATION

Kiln no.	Kind of kiln	No. of fire holes
A	Round	8
B	Round	8
C	Round	8
D	Round	9
E	Round	10
F	Round	10
G	Rectangular	18
H	Rectangular	20
I	Rectangular	22

NOTE: The types of kilns and conditions named in this article are purely hypothetical—being used merely to illustrate the case.

Firing Labor Operations.—Now turning to the duties of the firemen, we find that they are divided into the following component labor operations:

1. Placing of kindling wood and coal in fire boxes preparatory to lighting.
2. Firing of kiln at stated intervals.
3. Cleaning of fires and removing ashes.
4. Miscellaneous—such as taking trials, temperature readings, daubing of crown holes, etc.

Relation of Labor Operations to Kiln Temperature.—Since it is evident that the work becomes heavier as the kiln gains in temperature and that this condition at once gives us a basis for setting the Labor Standard, it is next necessary that we determine the relation between the labor operations and the progress of the kiln. Let us assume that the type of ware burned permits the kilns to be put under high fire at 72 hours, the burn being finished in 120 hours, and that the major operations of firing are tied in as outlined in Table II.

Actual Time for Each Labor Operation per Fire Hole.—Thus far we have analyzed the job and broken it up into its component parts. Our

Table II

Labor Operations per Stage of Burn

Shift	Hours under fire	Temp. F	No. times fired	Frequency and kind of cleaning	No. loads ashes per fire hole
1st Night......	12	160	5	"Shaking bars slightly"	...
Day........	24	250	6		...
2nd Night......	36	500	8		...
Day........	48	800	12	Use hook once	0.7
3rd Night......	60	1150	12	Use hook once	0.6
Day........	72	1400	12	Use spade once	1.0
4th Night......	84	1600	12	Use spade twice	1.4
Day........	96	1800	12	Use spade twice	1.4
5th Night......	108	2000	12	Use spade twice	1.4
Day........	120	2150	12	Use spade twice	1.4

next step is to take the stop watch and determine the time necessary for the completion of each element of the task, which we may find to be as shown in Table III.

Table III

Elementary Time Studies

Base, one fire hole, time given in minutes for each occurrence of firing or cleaning

Shift	Flat arches Firing	Flat arches Cleaning	Removing ashes
1st Night......................	1.0	...	....
Day......................	1.0	...	....
2nd Night......................	1.0	...	....
Day......................	1.0	5.0	8.5 minutes per load
3rd Night......................	1.0	5.0	
Day......................	1.5	6.5	
4th Night......................	2.0	8.0	
Day......................	2.0	8.0	
5th Night......................	2.0	8.0	
Day......................	2.0	8.0	

We can now combine the results given in Tables I to III since we have the main facts necessary for determining the Labor Standard. For instance, if we wish to know the time required for firing one fire hole during any one shift, we need only to multiply the time required for one fire by the total number of fires made; the time required for firing one fire hole during the fourth day, is found by multiplying 2 (see Table III) by 12 (see Table II). Likewise we find that the time for cleaning fires on this day is 16 minutes and that removing ashes takes 12 minutes. By applying this method throughout the burn, we obtain the results shown in Table IV.

Fatigue Allowance.—To permit a 50% fatigue allowance, it will be noted that the total man minutes shown for any one shift has been multiplied by 2. This allowance is purely assumed for this particular case, as no arbitrary figure can be set to cover all plants, but as kiln firing is very

TABLE IV

COMBINATION OF TIME STUDIES

Time in minutes—base one fire hole

Shift	Hrs. under fire	Temp. F.	Time for firing	Time for cl'n'g fires	Time for rem'g ashes	Total man minutes req'd.	Total man minutes req'd. × 2
1st Night.......	12	160	5.0	..	..	5.0	10
Day.........	24	250	6.0	..	..	6.0	12
2nd Night.......	36	500	8.0	..	..	8.0	16
Day.........	48	800	12.0	5.0	6.0	23.0	46
3rd Night.......	60	1150	12.0	5.0	5.0	22.0	44
Day.........	72	1400	18.0	6.5	8.5	33.0	66
4th Night.......	84	1600	24.0	16.0	12.0	52.0	104
Day.........	96	1800	24.0	16.0	12.0	52.0	104
5th Night.......	108	2000	24.0	16.0	12.0	52.0	104
Day.........	120	2150	24.0	16.0	12.0	52.0	104

heavy and hot work, a considerable period of rest must be allowed if the men are not to be overtaxed. This fatigue allowance also covers such miscellaneous duties as daubing crown hole covers, taking trials, etc.

Application of Standards to Each Class of Kiln.—Our next process is to apply the standards obtained per fire hole to each class of kiln. This procedure is outlined in Table V.

TABLE V

APPLICATION OF COMBINED TIME STUDIES FOR ONE FIRE HOLE TO AN 8 FLAT GRATE FIRE HOLE, ROUND KILN (NOS. A, B AND C.—SEE TABLE I)

Shift	Hours under fire	Temp. deg. Fahr.	Man min.[1] req'd including fatigue	Man min. reduced to man hours	Standard no. man hours selected
1st Night..................	12	160	80	1.3	2
Day..................	24	250	96	1.6	2
2nd Night..................	36	500	128	2.1	2
Day..................	48	800	368	6.1	6
3rd Night..................	60	1150	352	5.8	6
Day..................	72	1400	528	8.8	9
4th Night..................	84	1600	832	13.8	14
Day..................	96	1800	832	13.8	14
5th Night..................	108	2000	832	13.8	14
Day..................	120	2150	832	13.8	14

[1] Found by multiplying the minutes set for one fire hole (right hand column Table IV) by 8, the total number of fire holes.

In order to make the scheme as simple as possible, standards have been set to cover as wide a range of the burn as the circumstances permit. (See right hand column Table V.) The Labor Standard for an 8-fire-hole kiln is then 2 man hours from start of burn to 500°, 6 man hours from 500° to 1150°, 9 man hours from 1150° to 1400°, and 14 man hours from 1400° to finish of burn.

By applying this method to the various kilns listed in Table I we obtain the standards shown in Table VI.

TABLE VI

STANDARD MAN HOURS PER 12 HOUR SHIFT—PER STAGE OF FIRE

Kiln numbers	Temperature range 0–500	500–1150	1150–1400	1400-fin.	Standard man hrs. for lighting[1]
A-B-C	2.0	6.0	9.0	14.0	2.0
D	2.0	7.0	10.0	15.5	2.5
E-F	2.5	7.5	11.0	17.5	3.0
G	4.0	13.5	20.0	31.0	5.0
H	5.0	15.0	22.0	35.0	6.0
I	4.5	16.5	24.0	38.0	7.0

[1] Determined from actual time study.

It will be noted that in a number of instances the standards call for as low as 2 man hours or $^1/_6$ of a man. But how can we dispense with the services of part of a man? This, of course, cannot be done—but the standards adjust themselves when there are a number of kilns on fire. If kiln D was in the 2nd stage and kiln H was in the 1st stage, the total standard man hours would be twelve, or one man. There would be times, undoubtedly, when the standard would not call for an even number of men, but the scheme works out very well on an average. If the total standard of all kilns on fire called for 23 man hours, 2 men would necessarily be needed, while again if the standard called for 25 man hours, two men could still do the work and would then be over 100% efficient. It is a give and take proposition.

Flexibility of Standards.—Standards set as above can be applied to other burning schedules than the one from which the standards were deduced; *i. e.*, if on account of wet tile, it was not safe to reach 500° until after 48 hours had elapsed instead of 36, we would still use the labor standards for the range 0–500°.

Standards Once Set Should not be Changed.—It is to be remembered, however, that the success of the bonus scheme as a whole, is necessarily dependent upon the correctness of the standards set—which correctness, is in turn, dependent upon the man who sets the standards. This man who must be thoroughly grounded in the fundamentals of time study, should be capable of judging in his own mind whether the worker, whom he is timing, is doing a "fair day's work." Obviously, we would not set standards based upon the movements of the most efficient worker in the crew, any more than we would set standards based upon the least efficient; neither would we attempt to set the standard time for a given task until we had repeatedly timed the operation and assured ourselves that no stone had been left unturned in arriving at our conclusions. If the bonus system is to retain the mutual respect of company and men—standards once set

should *never* be changed unless conditions are changed—therefore the importance of correct standards.

Reward to Labor.—Turning again to the calculation; since we have now established a standard labor schedule how shall the firemen be rewarded for attaining this standard? We might base their premium on either a 10, 15 or 20% bonus curve, depending upon the attendant circumstances. Let us select the 15% curve as the standard in this particular instance.

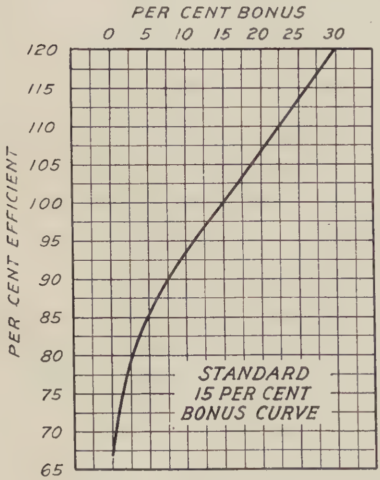


FIG. 1.

On this basis then each fireman will receive 15% additional wages for obtaining standard or being 100 per cent efficient. If only 90% efficiency is attained the bonus would come to 7.5%. A comparison between various efficiencies and bonus reward is shown in Figure 1.

How Company Gains.—The above procedure takes care of the fireman, he can increase his earnings 15% without undue exertion—but how about the company? Experience has shown that on most unstandardized work, labor efficiency approximates 70%. On this basis then, to reach standard—the firing force must consist of 7 men where there were ten—or in other words the force must be cut 30%. The company then will accordingly reduce its gross labor bill for firing 30%, paying out 70 cents where it spent $1 before. As against this saving of 30%, the company must pay a bonus of 15 per cent, on each 70 cents paid for labor or 10.5 cents. The total labor bill will then be 80.5 cents instead of $1, and the company will have realized a net saving of 19.5%.

It is also desirable in connection with the labor bonus to pay the firemen an additional bonus for attaining standards set on burning time, coal consumption and quality of product. We then have an ideal method for basis of payment, the reward is in proportion to accomplishment, the the fireman has been set up in business for himself, as his interests are identical with that of the company—namely to produce the highest quality ware, burned in the shortest time, with the least amount of coal and with the least amount of labor possible.

RESEARCH DEPARTMENT
LACLEDE-CHRISTY CLAY PRODUCTS CO.
ST. LOUIS, MO.

DISCUSSION ON "THE AMERICAN INTEREST IN CHINESE ART"

FREDERICK H. RHEAD:—The American interest in Chinese art is largely a collectors' interest, but more fundamentally, it is a students' interest.

China, in common with Greece, Persia, Italy and Japan, is one of the relatively few countries which has developed a national style of art which has been the inspiration to artists and craftsmen in most other countries.

The United States has not yet developed a strictly national style, although we are developing a school of architecture that is distinctly American. Our skyscrapers are responsible for this, but we are to a great extent following the European countries in drawing on Grecian, Renaissance, Gothic—and in the West, Spanish styles and adapting these to our own needs.

Owing to the peculiar construction of Chinese and Japanese architecture neither of these has been an influence in this respect. China and Japan are the only nations in the world where the capital, the principal ornamental feature of all other architectural styles, is unknown. But so far as bronzes, porcelains, jades, crystals, embroideries and ornamental detail are concerned, the Chinese designers and craftsmen have produced work which has influenced the Occidental artists and craftsmen, just as our architects have been influenced by the other periods named.

It is easy to understand that a country with no great national art will turn to those countries possessing distinctive types, and in the search for inspiration, the artists and sculptors will be influenced by the various masterpieces irrespective of their original source.

The period of growth, the highest point of development and the inevitable decline of a particular style has generally occupied a space of something like four hundred years. We find the greatest period of the Grecian vase development to be in the fourth century, B.C., the Della Robbia majolica vase about 1438, and the K'ang-shi period in China 1662–1722.

In all these great developments there is ample evidence that the activity has been under the protection of the reigning potentate, or subsidized by the respective government. A national interest, or a powerful individual interest in an art or science is bound to be productive because the means are provided to bring about the necessary development. As the Royal Sevres, Berlin and Copenhagen factories could not produce their fine works if France, Germany and Denmark did not contribute towards their support, it is very definite that the great historical art and architectural works would not have been produced if the reigning monarch of the period was not personally interested.

In China a revolution always resulted in an interruption in connection with her artistic development.

In the United States we have evidence of the necessity of subsidized or protected activities in the arts. It is only necessary to refer to the

various symphonic and operatic organizations. The big schools, libraries, and the museums must be endowed, and even our own Rookwood Pottery could not have continued its existence if it had not been liberally supported for a number of years before it became self-supporting. Then again, we need a Woolworth to build an epic in sky-scrapers, and a Stanford White to build a Madison Square Garden, one of the finest pieces of Renaissance architecture in this country.

The United States is awakening to the need of national art development, and is only following the steps of England and other European countries in turning to the great classical styles of Greece, Persia, China and Italy for inspiration.

Various artists seek different inspirations, interpreting these according to their individualistic skill and ability.

In the ceramic world, we find practically in the same period, Wedgwood using the Grecian motifs, while a number of the English porcelain manufacturers are copying the Chinese.

In the same way our artists and craftsmen are reaching out for the best that has been produced in other countries with the result that in course of time we will have absorbed what has been done before, and will consciously or unconsciously develop a great historic style of our own. In fact, we are already doing this.

New York at this time is admittedly the center of art in the world; chiefly because it is the greatest art market in the world, but also because of building activities such as the world has never known before. And all the arts are subsidiary or subordinate to that of architecture.

In looking for the best art work that has been done by other countries, we cannot as stated follow China in regard to architecture, but we can and do follow her decorative styles. The St. Louis Exposition of 1904 and the San Francisco Exposition of 1915 have no doubt been responsible for an increased popular interest in Chinese art, but the intellectual interest dates back further than this.

It dates back to the beginning of the growth of big business when individuals who had amassed great fortunes found the time to collect, and discovered the need of ownership of fine works of art.

Art is one of the great essentials of desirable human existence. Even the primitives discovered this. Directly the American business man developed his industries to the point where they are no longer individual activities, he would have the means and the time to acquire beautiful things for his surroundings.

That Chinese porcelains, rugs, jades and embroideries would be included is obvious, and it is equally obvious that the acquisition of such works by the wealthy would create a vogue or style which would be more or less popular among the general public.

This interest is reflected not only in connection with objects of art, but it is seen in the theater, the photoplay and in literature.

However, this national interest in foreign art is not permanent, or at least it is not to be the dominating influence. This country is too large and has contributed too much to the development of human accomplishment to be lacking in material, subject and epic for the artist, sculptor, craftsman and writer.

DISCUSSION ON "CAUSES OF BULGES ON STRUCK-OFF FIRE CLAY SHAPES"[1]

What is the cause of bulges or bellies upon the struck-off face of fire clay shapes molded by hand in wooden molds and not repressed, and what is the remedy for same?

E. H. Van Schoick:—It may be that this trouble is peculiar to our plant; we find that we have lots of trouble in making the simplest kind of a fire clay shape, as much as we do the most difficult one. About the simplest fire clay shape you can make would be a cube, say 10 or 11 inches square, and we find when we mold that shape by simply throwing the clay into the mold, and after that shape is dry, it will have a bulge on the side where it has been struck off, and after it is burned, the bulge will be still more pronounced. We have tried certain ways of remedying that, in our own plant, none of which has ever proved satisfactory except in certain particular cases. I was wondering if there was something radically wrong with our general method of molding these shapes.

To my mind, the cause is a greater density of clay through the center; we have endeavored to prevent this by hollowing out the center, deliberately hollowing it out, on one particular shape that we made. This was a shape for a flat arch. If you can hang your brick so that the bulged face only goes to the back, then you will get a tight joint, even if one face is bulged a little, because the other face will be slightly concave, but in those cases where the brick hang back to back, it causes a very pronounced opening in the arch. We hollowed out the clay on the top of the mold and filled up the hollow space with white sand. After it had dried, we had a hollow of $^3/_{16}$ of an inch deep in the top of a brick which did not measure over 10 inches across. After these brick were dried enough they were set back to back and when they came out of the kiln they were perfectly straight, with the dimensions through the center the same as the outside. It would seem that there is a greater density of the clay through the center.

F. Talbot:—I think he is on the right track to prevent this trouble, that is, to concave one surface of the tile.

E. H. Van Schoick:—Some of the men in our plant thought it was be-

[1] Discussion on Question R-26 at St. Louis Meeting, February, 1922.

cause the tile dried out faster on the top. The tile is put onto the floor on the struck-off face. We tried turning the tile onto its side, but no matter how we handled it after the tile was made, we always got the bulge.

F. H. Schwetye:—We have that same trouble at times, and we think it is caused sometimes by improperly making up grog and also by slicking cut off surface of tile.

We have taken tile which showed a bulge after it was burned, and broken it and found a void inside. This we attributed to poor molders, who made up grog improperly. Other tile that showed a bulge were solid and as sound as it would be possible to make them. We found these bulges due to slicking top of tile after cap was cut off.

We overcame this trouble by discontinuing slicking the cut off side. Instead of slicking we cut off the cap and branded the tile. We placed a convex board on top of tile, raised $^1/_{16}$ to $^1/_8$ inch depending on size of tile, and struck board with a mallet. We found this would overcome the bulging. When handling a fairly heavy tile this way we filled the hollow space with sand before turning out of mold onto offbearing or drying board.

We have most of our trouble with mixtures containing a large per cent of plastic clay, a fairly dense product. There is a resiliency to plastic clay when wet. You can compress it slightly when slicking causing body of clay near surface to be moved from its original position, and when slicking plane is removed you will leave a greater volume of clay in one spot than in another, causing bulge. The tile retains this shape through drying and burning. We still have the trouble and we have attempted to remedy it the same as you have by making the bottom slightly convex and also by putting it onto a block and putting sand on it.

A. F. Greaves-Walker:—Could this difficulty be due to slicking? When you run the slicker over the mold you in a measure compress or tend to compress more clay into the mold than it will hold. The clay mass will be compressed slightly as long as the slicker is on top but as soon as the slicker moves off the resiliency of wet clay will allow the clay mass to recover most of its original volume.

F. H. Schwetye:—We found that to be true. We overcame it by trimming the tile off. We cut it off but did not slick it, and then placed the convex surface of the board on top of the tile. In slicking you increase the pressure on your clay and its resiliency causes the clay to come back to its original shape.

E. H. Van Schoick:—We have used the same remedy. Where we slicked the tile with water, we now simply cut them off and place the tile onto a slightly convex board; thus a slightly concave surface is obtained on the tile.

F. H. Schwetye:—We have that trouble, only with some clays, not all of them.

Mr. Greaves-Walker:—The trouble seems to be more with the plastic clays than with the non-plastic, which indicates that it is due to the resiliency of the clay.

A Member:—Would it do any good to vent the shape, say by puncturing the tile after it had been formed? If the bulging was due to gas, it might be remedied by allowing the gas to escape.

E. H. Van Schoick:—We punched our tiles full of all kinds of holes.

A Member:—In tiles that have been slicked, it will be found in many cases that the trowel has forced the coarse particles down to a depth of three-sixteenths of an inch. That portion at least, is of much finer grain than the rest of the tile. When you get coarse and fine materials, you are going to have a difference in shrinking and burning. Take the other side of that, where it has been put on a mold, and you will find that the bottom instead of being of dry material, in that wet mold the coarse will go to the bottom and that gives a tendency to the entire tile to bulge. Additional troweling that the molder often does in finishing it up to make it nice and smooth to look at, forces the coarse part away from the top.

A. F. Greaves-Walker:—We run across that difficulty sometimes in the manufacture of magnesite shapes, but it usually occurs when the material is a little too wet. When he has not a perfectly flat surface, the molder takes his fingers and presses out a small amount of material; sometimes he does that twice, and eventually brings it down to a perfectly flat surface, showing that it is caused by too much material.

E. H. Van Schoick:—We use a large proportion of plastic clay in our tile.

A Member:—In using the open burning clays in Northeastern Kentucky we never had any trouble like that at all, but in using some very plastic Indiana clay we have had it and sometimes it causes a great deal of trouble. Can it be that this is possibly due to the expansion of some colloidal matter in the clay? In making up some test bricks of some plastic coal mine clay, I noticed when we tried to mold this mud, it would expand to such a degree that it was almost impossible to get the shape wanted. It seemed to me there was some material there that was expanding.

A. F. Greaves-Walker:—I don't know whether we have suggested anything to Mr. Van Schoick that will clear the atmosphere for him or not, but he at least knows that he is getting as good results as the rest of us. There are but a few ways to overcome this difficulty and he probably has them.

DISCUSSION ON THE "MEANING AND MICROSCOPIC MEASUREMENT OF AVERAGE PARTICLE SIZE"[1]

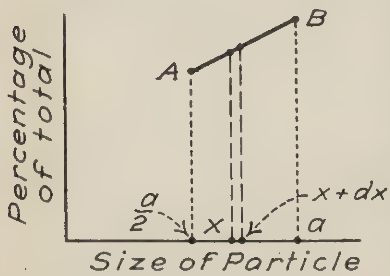
J. C. Pearson:—This paper should be of considerable interest to those concerned in any way with the properties of finely divided materials, es-

[1] Perrott and Kinney, *Jour. Amer. Ceram. Soc.*, **6** [2], 417–39 (1923).

pecially to those who are interested in methods of determining the gradation of powders too fine to be handled with sieves. The discussion of the meaning of average particle size is a valuable contribution, and the general mathematical treatment will be an aid to many who have tried to interpret the results of mechanical analyses.

The authors have done well to emphasize that the sizes or diameters of irregular particles are wholly arbitrary when one wishes to express and use these quantities in such way as to bring out certain characteristics of a large group of particles as a whole. As this fact is indisputable, it is sometimes convenient and permissible to make certain simple assumptions in regard to shapes and sizes of particles that lend themselves readily to mathematical treatment. Thus one may frequently arrive at an approximate result with a small fraction of the physical and mental effort that he would otherwise be put to.

The question in which the writer is particularly interested is whether the microscopic analysis is, after all, as simple, easy, and satisfactory a method as air elutriation for arriving at the specific result desired by the authors, namely an average particle size of pulverized coal such that one-half the weight of the material consists of particles coarser than this size, and one-half finer than this size. The thought which gave rise to this question was that in the studies of fine aggregates for concrete, we are accustomed to use sieves the openings of which form a geometric progression, the standard methods for sieve analyses of such materials specifying the use of sieves No. 100, 50, 30, 16, etc., in which the constant ratio of 2 is maintained between the openings of the successive sieves. This standard has been adopted by the A.S.T.M. on the general belief that for most purposes the gradation of a fine aggregate is sufficiently well determined by these particular sieves. Assuming this to be true, it is obvious that the computation of "fineness modulus" or "surface modulus," or any other factor based on the mechanical analysis of a graded material is greatly simplified by the simple ratio of sizes which exists between the successive fractions.



As an illustration of this last statement let us find an expression for the number of particles of a graded material passing a given sieve and retained on the next finer sieve of the series.

In the diagram let A and B be two points on the mechanical analysis curve of a graded material, the ordinates of A and B representing the percentages of the total sample passing any two successive sieves, and the abscissae representing the sieve openings, which may be designated as a

and $a/2$. Then the straight line AB is an approximation to the portion of the true sieve analysis curve between A and B, and is the *actual* curve if we assume an even gradation of particles in this fraction.

Let M = total mass of particles between the two sieves and dM = mass of particles with diameters between x and $x + dx$.

$$\text{Then } \frac{dM}{dx} = \frac{M}{a - \frac{a}{2}} = \frac{2M}{a} = K \text{ a constant.} \tag{1}$$

Let dN = number of particles with diameters between x and $x + dx$.

Then $dN = \dfrac{dM}{mx}$, where mx = mass of particles of diameter x.

Assuming the particles to be spheres, $mx = \dfrac{\pi\rho x^3}{6}$. From (1) $dM = Kdx$,

$$\text{Hence } dN = \frac{Kdx}{\frac{\pi\rho x^3}{6}} = \frac{6K}{\pi\rho} \cdot \frac{dx}{x^3} \tag{2}$$

Integrating (2) between the limits a and $\dfrac{a}{2}$ we get $N = \dfrac{9K}{\pi\rho a^2}$. Substituting for K from (1)

$$N = \frac{18}{\pi} \cdot \frac{M}{\rho a^3} = 5.73\,\frac{V}{a^3} \tag{3}$$

where N is the total number of particles between the sieves and V is the absolute volume of the particles, which in the case of a homogeneous material is proportional to the weight of the fraction.

Hence under the assumptions made, the number of particles between two consecutive sieves is proportional to their combined weight and inversely as the cube of the openings of the sieves. Equation (3) is of course an approximation to the truth, but possibly near enough for practical purposes. The important thing is that equation (3) holds for every fraction obtained in the sieve analysis, and consequently serves to give a very simple estimate of the total number of particles in a given sample of graded material.

The purpose of this somewhat detailed reference to the advantages of a sieve analysis in which the sizes of separation form a geometric series with a simple ratio of 2 is to suggest that these same advantages are maintained in any sort of a mechanical analysis based on the same ratio of sizes, no matter what methods or what materials are used. Thus in the cement testing laboratory at the Bureau of Standards the air elutriator referred to by the authors has been so adjusted as to give nominally sizes of separation of 40, 20 and 10 microns, these fitting approximately into the geometric series of openings of the testing sieves referred to above. If

pulverized materials for which elutriation methods are applicable are so graded that not too great a proportion of the particles are of nearly the same size, or in other words, if the component particles are well graded in the sense that we speak of a sand for mortar or concrete as being well graded, their properties and characteristics ought to be thus determined as well relatively as are those of fine aggregates by the standard methods of sieve analysis.

It has been interesting therefore to see just what result would have been obtained from elutriation methods alone for the average particle size of the sample of coal used by the authors to illustrate their method of microscopic analysis. In order to do this, it is necessary to assume that the percentages of the several sizes of coal particles as given in the last column at the bottom of page 432 represent approximately the true mechanical analysis of the sample, whether these were obtained by microscopic analysis or by elutriation methods. From the figures given we find the following distribution of sizes:

10 microns	12.6%
20 microns	16.8
40 microns	33.2
60 microns	37.4
Total	100.0%

The number of particles in each of these groups is, as indicated in the previous discussion of sieve separations, proportional to the percentage by weight and inversely to the cube of the separation size, but because the limiting size of the coarsest fraction does not fall in the geometric series, a different constant of proportionality must be determined for the 40–60 fraction above. This is easily found by substituting in the derivation of the N formula the integration limits a and $\frac{2a}{3}$, from which the number of particles in this coarsest fraction becomes $N = 0.58\,\frac{V}{a^3}$ instead of $N = 5.70\,\frac{V}{a^3}$ for the other fractions.

Remembering now that we may substitute the percentages of the fractions by weight for V, and using the authors' tabular scheme of calculation on page 432, we have

Number of particles	Diameter, microns	$d.^4 \times$ No.	$d.^3 \times$ No.
$5.73 \times 12.6/10^3$	10	722	72.2
$5.73 \times 16.8/20^3$	20	1925	96.3
$5.73 \times 33.2/40^3$	40	7610	190.2
$3.58 \times 37.4/60^3$	60	8035	133.9
	Sums	18292	492.6

$$\text{Average diameter} = \frac{18292}{492.6} = 37.1 \text{ microns.}$$

This value is in very close agreement with that deduced by the authors, and the writer is therefore of the opinion that the elutriation method is at least capable of giving a satisfactory result.

From the data presented in the paper, the writer is far from convinced that the "amount of time saved by the elimination of the elutriation procedure is enormous." On the contrary the eye-strain and mental effort accompanying the count and estimate of size of many hundreds of particles, the lengthy computations involved, and the many chances for error to creep in, would seem to urge the investigator to find some simpler method. The authors have evidently not appreciated the virtues of the air elutriator, by means of which the complete analysis and exceedingly simple computations involved would require at most two days, one of these being allowed for the 10 micron separation. During these days many other duties might be performed while the elutriator was automatically doing the major portion of the work without attention from the operator.

THE CERAMIC ENGINEERING DEPARTMENT OF THE UNIVERSITY OF WASHINGTON, SEATTLE, WASHINGTON[1]

By Hewitt Wilson

Educational

A four-year curriculum in ceramic engineering has been developed and tried out at the University of Washington, Seattle, Wash. It is based on the ceramic instruction given at the Ohio State University and the University of Illinois, but with more training in the geology and working of clay deposits. During the development period of this complete program, elective courses in cements, limes, and plasters, refractories, and general ceramics have proven popular with the civil, metallurgical, and chemical students.

The Ceramic Laboratory

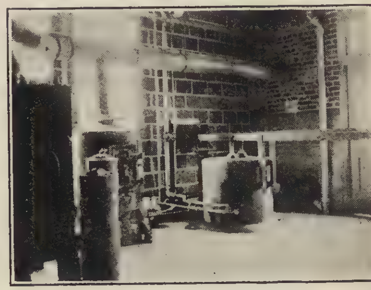
A ceramic laboratory occupying 7,350 sq. ft. total floor space has been built and equipped with the best types of ceramic machinery. It is the only public ceramic laboratory on the Pacific Coast and compares very favorably with the best in the eastern parts of the United States. The ceramic department is housed in the New Mines Laboratory (1921) which is the first building erected in the New Mines group and is the latest representative of the collegiate Gothic style of architecture adopted by the University. The structure is four stories in height, with steel frame, reinforced concrete walls and floors, brick face, terra cotta trim, and slate roof with copper trimmings. A special feature of the building is the unusually large window area. An electric elevator serves all floors; hot and cold water, steam, compressed air, gas, and electricity for lighting, power, and electrolytic purposes, reach all the laboratories.

The ceramic laboratories, together with the offices and classrooms, occupy the northern two-fifths of the building, including the main entrance hall. Apparatus for both manufacturing and testing ceramic products has been provided. The heavy brick

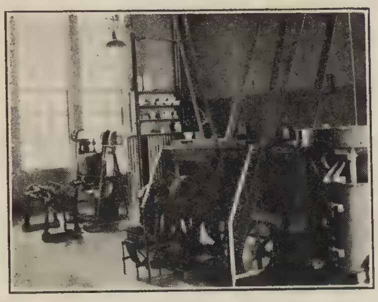
[1] See Wilson, *Jour. Amer. Ceram. Soc.*, **6** [1] 110–14 (1923).

machinery, located on the first or ground floor, consists of a 4-foot Crossley dry and wet pan, a Mueller universal auger machine large enough for side-cut brick and tile with a cutting table, and a large American dry press. The pottery machinery includes a Pat-

Corner in Ceramic Physical Chemical Laboratory.



High temperature load test kiln.



Pottery and brick machinery.

Spraying and grinding machinery.

Heavy clay products machinery.

Grinding equipment..

terson clay-washing outfit with a double blunger, power screen, agitator, pump and filter press operated with compressed air; a potter's pug mill; jolly wheel and plaster molds for both jollying and casting ware. The terra cotta equipment consists of pressing molds, a De Vilbiss spraying apparatus, engobe and glaze materials and glaze-grinding ball

TABLE I

CERAMIC ENGINEERING CURRICULUM

Autumn Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
		First Year			
Mathematics 51	4	Mathematics 52	4	Mathematics 53	4
Civil Engineering 1	3	Civil Engineering 2	3	Civil Engineering 13	3
Civil Engineering 11	3	Civil Engineering 12	3	Civil Engineering 21	3
Chemistry 1 or 21	5	Chemistry 2 or 22	5	Chemistry 3 or 23	5
Mil. Sci. or Phys. Ed.	1 2/3	Mil. Sci. or Phys. Ed.	1 2/3	Mil. Sci. or Phys. Ed.	1 2/3
		Second Year			
Mathematics 61	3	Mathematics 62	3	Ceramics 90	3
Physics 97	5	Physics 98	5	Physics 99	5
Geology 1	5	Geology 21	5	Geology 120	3
Mining 51	3	Civil Engineering 27	3	Chemistry 111	5
Mil. Sci. or Phys. Ed.	1 2/3	Mil. Sci. or Phys. Ed.	1 2/3	Mil. Sci. or Phys. Ed.	1 2/3
		Third Year			
Civil Engineering 131	3	Civil Engineering 132	3	English 4	3
Mining 101	3	Metallurgy 153	3	Metallurgy 102	5
Chemistry 181	3	Chemistry 182	3	Ceramics 102	3
Ceramics 100	3	Ceramics 101	3	Ceramics 110	2
Ceramics 104	3	Ceramics 105	3	Mining 106	2
Mining Practice in Summer Vacations.[1]		**Fourth Year**			
Ceramics 121	5	Ceramics 122	5	Ceramics 123	5
Ceramics 131	3	Ceramics 132	3	Ceramics 133	2
Electives	7	Mining 103	1	Electives	8
		Electives	6		

[1] Practice in mining, metallurgy, geology, or ceramics, accompanied by a report on the work performed is required of all students during a summer vacation following the sophomore or junior year.

mills. The firing apparatus, installed on the first floor includes an oxygen-acetylene cone fusion furnace; a 3-foot, high-temperature, down-draft load-test kiln for two brick; two portable muffle pottery kilns; a 7 by 10-foot open-fired, down-draft brick kiln; and a future 8- by 10-foot terra cotta and glaze kiln of the muffle type. The kilns are equipped with Brown pyrometers and fired with both gas and oil. The underground flues lead to a stack which rises to the full height of the building. General testing apparatus consists of sample molds, a small Mueller auger machine, a sample dry press, aging cellar, three types of volumeters, steam dryer, a constant temperature electric dryer, and transverse and tensile strength machines. The ceramic museum, library, and office, physical-chemical laboratory, and locker room are on the third floor. Lecture, pottery class and storage rooms occupy the fourth floor. Besides the $52,000 ceramic portion of the $130,000 building, over $6,000 has been spent for the purchase and installation of machinery.

Coöperation with the other departments of the University and Bureau of Mines increases the facilities for ceramic work. As one of the chief problems in the Pacific Northwest is the locating and testing of raw materials, the geology department of the College of Science is often called on for advice. For the mining and winning of the raw materials, the experts of the mining department are available. The analytical department of the Bureau of Mines coöperates in the analysis of clay and materials; and the special equipment of the forest products laboratory and the chemical, civil, mechanical, electrical, and highway departments may be used when necessary. The electrometallurgy laboratory is equipped with transformers, voltage regulators, and switchboard, through which power can be used at rates ranging up to 3600 amperes and at voltages varying from 1 to 484. Advantage has been taken of the electrical equipment in a special study of super-refractories, in which clays, sillimanite, and magnesia mixtures have been fused.

Courses in Ceramics

90. Ceramic Materials.—Origin, occurrence, physical properties and preparation of clays, feldspar, limestone, magnesite, silica, and other materials used in the ceramic industry. Prerequisite, sophomore engineering or mining standing. Three lectures and recitations. Three credits; spring.

100. Ceramic Products.—Principles governing the shaping of structural, refractory and fine ceramic wares. Prerequisite, Ceramics 90. Three lectures. Three credits; autumn.

101. Drying and Burning.—The principles of drying and burning; the operation and control of commercial dryers and kilns. Prerequisite, Ceramics 100. Three lectures and recitations. Three credits; winter.

102. Ceramic Decoration.—The preparation and characteristics of vapor, natural clay slip, raw lead, bristol, terra cotta, porcelain and fritted glazes, bright and matt, with methods of coloring. Prerequisite, Ceramics 101. Three lectures and recitations. Three credits; spring.

104, 105. Ceramic Calculations.—The chemistry and physics of preparing, drying and firing ceramic materials. Problems involved in standard methods of testing clays. The blending of raw materials for ceramic bodies and glazes. Prerequisite, Ceramics 90. Three recitations. Three credits; autumn and winter.

110. Ceramic Physical-Chemical Measurements.—Laboratory testing of clays and other ceramic materials. Determination of fineness of grain, shrinkage, porosity and specific gravity; the study of plasticity, bonding power, vitrification and fusion, chemical purification and action of colloids. Prerequisite, Ceramics 105. Laboratory deposit, $10 per quarter. Two laboratory periods. Two credits; spring.

121, 122, 123. Ceramic Products Laboratory.—Laboratory production of structural wares, stoneware, yellow ware, porcelain and refractories. Practice in blending of ceramic materials, molding, drying, firing and glazing ceramic products. Prerequisite, Ceramics 101. Laboratory deposit, $12 per quarter. Three laboratory periods and two recitations. Five credits per quarter; autumn, winter, and spring.

125, 126, 127. Ceramic Plant Design.—Design of ceramic plants. Arrangement of machinery and construction of storage bins, dryers and kilns. Prerequisite, Ceramics 101. Two laboratory periods and one recitation. Three credits; autumn, winter, and spring.

131, 132, 133. Ceramic Thesis.—An original investigation, bearing principally on the ceramic problems of the Pacific Northwest. Laboratory deposit, $5 to $10 per quarter. Laboratory and conference. Three credits, autumn and winter; two credits, spring.

140. Pottery.—Occurrence, winning and preparation of materials used in pottery manufacture. Processes used in molding, drying, firing, glazing, and decorating of pottery. Two lectures and recitations. Two credits; autumn.

150. Lime, Plasters and Cements.—The raw materials, manufacture and testing of lime, calcined gypsum, sand-lime brick, and Portland cement. Prerequisite, Chem. 3. Three lectures and recitations. Three credits; winter.

160. Glass Technology.—Theory and factory practice of glass manufacture. Prerequisite, Ceramics 105. Two lectures and recitations. Two credits; autumn.

170. Metal Enamels.—Theory and practice of metal enameling. Prerequisite, Ceramics 105. Two lectures and recitations. Two credits; autumn.

180. Refractories.—Origin, occurrence and physical properties of fire clays and other refractory materials. The manufacturing problems of fire clay, silica, magnesia, chromite brick, electric furnace products and special refractories. Prerequisite, junior standing. Two recitations and one laboratory period. Laboratory deposit, $5. Three credits per quarter; autumn, winter or spring.

191, 192, 193. General Ceramics.—Occurrence, winning and preparation of materials used in ceramics. Processes used in preparation of raw materials, shaping, drying and firing of ceramic products. One recitation and two laboratory periods. Laboratory deposit, $10. Three credits; autumn, winter and spring.

221, 222, 223. Ceramic Resources.—A study of the ceramic resources of Washington and the Pacific Northwest, or of some particular area in this region. Prerequisite, graduate standing. Hours and credits to be arranged.

231, 232, 233. Ceramics Manufacture.—Studies in the manufacture of clay products, especially the utilization of raw materials found in the Pacific Northwest. Prerequisite, graduate standing. Hours and credits to be arranged.

UNIV. OF WASHINGTON
SEATTLE, WASH.

PRESIDENT'S PAGE

AIMS OF THE AMERICAN CERAMIC SOCIETY

In this, my first appearance on the President's page, I wish to call the attention of the members to some of the more important things which the officers wish to accomplish during the year.

Of first importance is the fact that the Budget Committee laid out a financial program which calls for approximately $9,000 above the 1922 income. It was found necessary to do this if the work of the SOCIETY was to go forward. This additional $9,000 must come from two sources: advertising in the *Journal*, and new members. It, therefore, becomes the duty of every member interested in this SOCIETY to add to the *Journal* advertisements and it is further important that the membership encourage advertising in the *Journal* by patronizing, whenever possible, the advertisers and neglecting in no instance to call the attention of our advertisers to the fact that their advertisements are being read.

There are undoubtedly hundreds of men interested in some branch of our industry, especially among the consumers, who would willingly join the SOCIETY, either as a Corporation member or Associate member, if the matter was called to their attention. Will not each member of the SOCIETY constitute himself a member of the Membership Committee and "leave no stone unturned" to interest new men in joining us?

It is the hope of the officers that new life will be injected into the Sections which already exist and that a number of new Sections will be formed during the year. Preliminary moves to form new Sections have already been made in Detroit, East Liverpool, Baltimore-Washington and Los Angeles. It is hoped that members living in these districts will give their whole hearted support to the men who are making the initial moves.

In order that the SOCIETY may function as a promoter of ceramic research it is extremely desirable that the Research Committees of the various Divisions make up a list of the important research problems in their particular branch of the industry. Heads of the Ceramic Schools and the Directors of the Bureaus, as well as the heads of the various Departments of Engineering in Universities all over the country will welcome suggestions and much good and valuable work can be gotten under way in this manner.

ACTIVITIES OF THE SOCIETY

ALL OUT FOR THE BARNYARD GOLF SQUAD!

Professional sporting writers no doubt turn their thumbs down and their noses up at intramural sports, but this only sends our opinion of them lower and of ourselves higher, for we have had more fun this month watching our members pitch horseshoes and shoot—marbles. Every day at ten-thirty and at two-thirty the lists were thrown open with a paper-knife and all entries noted. The University of Illinois Ceramic department sent a gallant team, to wit, Hursh and Parmelee. These two for a while tied for first place in the horseshoe parallelogram, but Hursh dropped ballast by cashing some of the AMERICAN CERAMIC SOCIETY bonds and was able to make another ringer, thus putting himself ahead. Sam Wilkinson of Trenton went west for early spring practice and brought back a record flight of the lucky omens.

What we like to see best is the staid officials of weighty corporations, and the important carriers of government-owned brief cases, throwing off their coats and cares to enter into the sport. Look at the list—W. B. Kerr, C. F. Tefft, L. I. Shaw, A. S. Watts, Karl Türk, to mention only a few.

Like lambs in the springtime, the younger members gamboled on the green (roll along, mah beauties), and did their share of increasing the general joy.

To come down to brass tacks, U. S. currency, there were twenty-five persons who advertised the SOCIETY, eight more than last month, with a consequent increase of eight in the number of converts. The needed average of personal memberships, 7.31 a week, has been more than reached. That the needed average of corporation memberships was not reached, means that we must concentrate. Seat yourself firmly before your desk, press the thumbs and forefingers together, close the eyes and *think* of a prospective Corporation Member. Seize the telephone or your hat, and call up or on said prospect. Mail the resulting card to the Secretary of the SOCIETY and receive your due in the June number of the *Journal*. Go at least one better than these:

	Personal	Corporation
R. K. Hursh	3	
C. W. Parmelee	2	
Samuel Wilkinson	2	
Charles A. Smith	1	
Lawrence H. Brown	1	
C. E. Fulton	1	
Paul K. Klaesius	1	
Hobart M. Kraner	1	
A. L. Duhart	1	
L. I. Shaw	1	
Horace H. Clark	1	
Leon J. Frost	1	
Chas. H. Modes	1	
Robert F. Ferguson	1	
W. B. Kerr	1	
A. Malinovszky	1	
W. E. Buck	1	
A. S. Watts	1	
C. Forrest Tefft	1	
Ruth E. Canfield	1	
Alice A. Ayars	1	

	Personal	Corporation
J. M. Manor	1	
Karl Türk	1	
Alexander Silverman	1	
Wilbur F. Brown	1	
Office	8	3
Total	37	3

Status of Membership

March 14, 1923	1710	223
Resigned	9	0
	1701	223
New Members	37	3
April 14, 1923	1738	226

NEW MEMBERS FROM MARCH 14, 1923, TO APRIL 14, 1923

ASSOCIATE

Ammon, Millard G., 53 Euclid Ave., Columbus, Ohio, Student, O. S. U.

Armstrong, Robert Hood, Watsontown, Pa., Ceramic Engineer, Fiske & Co., Inc., Watsontown, Pa.

Ayars, Alice A., 1914 West Boulevard, Cleveland, Ohio. Glazing and Firing Pottery for Cleveland High School.

Bradley, Richard S., 105 Daniel St., Champaign, Ill., Student, Univ. of Ill.

Briggs, Wm. B., 281 Margueritta St., Toronto, Ont., Can., Supt. Enameling and Mixing Dept., Standard Sanitary Mfg. Co., Toronto, Ont., Can.

Carter, John D., 121 S. 3d St., Philadelphia, Pa., Philadelphia Quartz Co.

Clark, H. E., Room 409 Whitney Bldg., 310 Main St., Springfield, Mass., Treas. & Gen. Mgr., The Springfield Brick Co.

Deeds, Floyd D., Grant St., Newell, W. Va., Ceramic Asst., E. M. Knowles China Co.

Douglas, Freeman S., Box 108, East Liverpool, Ohio., Asst. Engr., The Babcock & Wilcox Co.

Eccles, J. H., 371 Aqueduct St., Montreal, Can., Canada Firebrick Co., Ltd.

Ely, William Grosvenor, Jr., Y. M. C. A., Kokomo, Ind., Asst. Supt. Pittsburgh Plate Glass Co.

Fliedner, Helen M., 1971 West 99th St., Cleveland, O., Supervisor of Art.

Giacomini, Clarence D., 770 Osage St., Leavenworth, Kan., Head of Enameling Dept., Great Western Stove Co.

Harrison, Harold C., 791 Oak St., Columbus, Ohio, Student, O. S. U.

Herger, Howard C., % Pierce Glass Co., Port Allegany, Pa., Secy. and Chem.

Jenkins, S. Mark, 420 Bulkley Bldg., Cleveland, Ohio, Dist. Mgr. Cleveland District, Celite Products Co.

Ladoo, Raymond B., 1448 Girard St., N. W., Washington, D. C., Mineral Technologist, Bur. of Mines, Washington, D. C.

Leibowitz, Samuel, Haines and Russel St., Baltimore, Md., Mgr. Maryland Chemical Co.

Manley, Rowland, 3820 Cornelia Ave., Chicago, Ill., Ceramic Engr., Peoples Gas Light and Coke Co.

Matlack, W. Fred, Golding Sons Co., Trenton, N. J., Mgr. Trenton & Wilmington Depts.

Meadows, A., 5509 Brooklyn Ave., Detroit, Mich., Chief Engr., The Detroit Vapor Stove Co.

Mountford, Enoch, 315 Ardmore Ave., Trenton, N. J., Gen. Mgr., Anchor Pottery, Trenton, N. J.

Owen, C. E., Box 108, East Liverpool, Ohio, Ceramist, The Babcock and Wilcox Co.

Platts, Matthew, Box 52, Millrae, California, Factory Mgr., West Coast Porcelain Mfrs.

Pfeiffer, Wilbur H., 814 West Main St., Urbana, Ill., Student, Univ. of Ill.

Pole, Gordon R., Mellon Institute, Pittsburgh, Pa., Asst. Fellow.

Reif, Richard E., 706 Gregory Place, Urbana, Ill., Student, Univ. of Ill.

Seasholtz, Ralph Edgar, 1236 Hill Road, Reading, Pa., Foreman with J. M. Seasholtz, Inc.

Schofield, Perlee W., Chicago Heights, Ill., Pres. & Gen. Mgr., Chicago Heights Bottle Co.

Skinner, Sherrod E., 699 Stanley St., New Britain, Conn., Mechanical Engr., Landers Frary & Clark.

Smith, Albert J., 111 Richardson St., Syracuse, N. Y., Supt. Iroquois China Co.

Tracy, Ray C., % Washington Iron Works, Los Angeles, Calif., Foreman, Enameling Dept.

Vaughn, Haydn E., 7107 Mt. Vernon St., Pittsburgh, Pa., Student, Univ. of Pitts.

Walworth, Chester Alexander, % Libbey-Owens Sheet Glass Co., Charleston, W. Va., Chemist.

White, Francis Guy, University Club, St. Louis, Mo.

Yang, S. D., Box 46, University Station, Urbana, Ill., Student, Univ. of Ill.

Wu, Tso Ming, 160 W. 9th Ave., Columbus, Ohio, Student, O. S. U.

Corporations

American Blower Company, 6004 Russell St., Detroit, Mich., Thomas Chester.

Karr Range Co., Belleville, Ill., T. A. Stoelzle, Gen. Mgr.

The River & Feldspar Company, P. O. Box 581, Middletown, Conn., A. C. Postley, Secy. & Treas.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Samuel P. Adams is living at 316 South Grove Street, Oak Park, Ill.

Russell E. Arnold who has been at Derry, Pa. has been transferred to the Research Building, Westinghouse Elec. and Mfg. Co., at East Pittsburgh, Pa.

Bertram L. Cassady has moved from Chippewa Lake, Ohio to Tulsa, Okla.

Arthur L. Donnenwirth who has been with the Jeffery-Dewitt Insulator Co., at Kenova, W. Va., is now with the Westinghouse High Voltage Insulator Co., at Derry, Pa.

Karl L. Ford has changed his address to 3156 18th Street, N. W., Washington, D. C.

Harry D. Foster, also of the Bureau of Standards in Washington, has moved to 4310 4th Street, N. W., Washington, D. C.

R. B. Gilmore until recently located at the Ceramic Experiment Station, U. S. Bureau of Mines, Columbus, has accepted a position with the Laclede-Christy Clay Products Company, St Louis, Mo.

Arthur F. Gorton, formerly with the National Malleable Castings Co., at Cleveland has accepted a position with the Western Electric Company, Hawthorne Station, Chicago, Ill.

C. A. Hahn has left the Parker Russell Mfg. Co. and is now with the Missouri Fire Brick Co., Security Bldg., St. Louis, Mo.

Marsden H. Hunt is now with the Western Electric Company, First National Bank Building, San Francisco, Cal.

Robert W. Jones, geologist at Catskill, N. Y., is living at 15 New St.

Hobart M. Kraner who was formerly with the Ceramic Experiment Station, U. S. Bureau of Mines, Columbus, is now with the A. C. Spark Plug Co., at Flint, Mich.

J. L. Laird has affiliated himself with the Research Department of the Ford Motor Co., and is living at 25 Francis Street, Dearborn, Mich.

T. Poole Maynard is located at 1526 Hurt Bldg., Atlanta, Ga.

J. C. Montgomery, recently of the Limoges China Co., Sebring, Ohio is with the Atlas China Co., at Niles, Ohio.

C. P. Nye is now with the Conemaugh Iron Works, Blairsville, Pa. Mr. Nye was formerly manager of the Richmond Radiator Company of Uniontown, Pa.

Harold H. Preston lives at 415 Dithridge Street, Pittsburgh, Pa.

John Rhead is with the Sanitary Earthenware Specialty Co., of Columbus, Ohio.

Fred H. Robertson writes that he has moved from Los Angeles, Cal., to 204 West Tomita Street, Glendale, Cal.

Oscar Scherer is now at 212 4th Ave., North Nashville, Tenn.

T. A. Shegog has removed recently from New York City to 345 Indiana Ave., W., Sebring, Ohio.

Charles L. Stamm is living at 29 South 12th Street, Mt. Vernon, N. Y.

Jack Holmes Waggoner, late of the Canadian Libbey Owens Sheet Glass Co., Ltd., has moved to Topeka, Kans., Route 27.

C. P. Wood has been transferred from the Philadelphia office of Lockwood, Greene and Co., to 101 Park Ave., New York City.

Y. Y. Wong of the Chen Kwong Co., is now at 237 Des Voeux Road, Hong Kong, China.

NO ADDRESSES

Information regarding the addresses of any of the following members will be received with thanks by the Secretary's office. A few of the names published in the December issue of the *Bulletin* have been located.

G. V. Baker, Penn Feldspar Co., Barnard, N. Y.

Earl A. Bickel, Postville Clay Products Co., Postville, Iowa.

J. P. Callaghan, Teaque Hotel, Montgomery, Ala.

C. V. Cameron, Whiting-Mead Commercial Co., 2035 E. Vernon Ave., Los Angeles, Cal.

Homer T. Darlington, Box 736, Natrona, Pa.

Charles S. Dolley, Keramoid Mfg. Co., Fort Madison, Iowa.

Koji Fujioka, Shofu Porcelain Mfg. Co., Kyoto, Japan.

John L. Greenwood, Lehigh Sewer Pipe and Tile Co., Lehigh, Iowa.

S. B. Henshaw, Libbey-Owens Sheet Glass Co., Charleston, W. Va.

Sidney H. Ivery, 4432 Gibson Ave., St. Louis, Mo.

William J. Johnson, 4148 Langland St., Cincinnati, Ohio.

Y. Kitamura, Shofu Kogo Kafushiki Kaisha, Kyoto, Japan.

J. M. Knote, Mines Dept., L. S. Corporation, Sault Ste. Marie, Ont., Canada.

Leon W. Mitchell, Rock Island, Ill.

Knud Y. Chr. Moller, 4956 McPherson Ave., St. Louis, Mo.

K. Okura, 84 Kobayashi-Cho, Nagoya, Japan.

W. Pendrup, Coonley Mfg. Co., Cicero, Ill.
H. M. Pulsifer, Manhattan Bldg., Chicago, Illinois.
Nugent A. Ragland, 1280 West Adams St., Los Angeles, Cal.
Tefft, T. Dwight.
J. E. Thompson, 2507 Townsend Ave., Detroit, Mich.
A. L. Van Moore, American Photo. Glass and Export Co., New Eagle, Pa.
William J. Vodick, 1733 Lake Ave., Wilmette, Ill.

OFFICIAL PERSONNEL OF THE ENAMEL DIVISION

Officers

H. F. Staley, *Chairman*
Metal and Thermit Corp.
120 Broadway, New York City
R. R. Danielson, Secretary
Beaver Enameling Co.
Ellwood City, Pa.

Councilors

H. C. Beasley
Coonley Mfg. Co.
Cicero, Ill.
W. C. Lindemann
A. J. Lindemann & Hoverson Co.
Milwaukee, Wis.
M. E. Manson
Rundle Mfg. Co.
Milwaukee, Wis.
D. F. Riess
The Vollrath Co.
Sheboygan, Wis

Standing Committees
Research

R. R. Danielson, *Chairman*
Beaver Enameling Co.
Ellwood City, Pa.

Sheet Iron and Steel

Adams, L. A.
Mansfield Vitreous Enameling Co.
Mansfield, Ohio
Aupperle, J. A.
American Rolling Mill Co.
Middletown, Ohio
Bardush, J. F.
Grand Rapids Refrigerator Co.
Grand Rapids, Mich.
Blackburn, C. A.
Cleveland Metal Products Co.
Cleveland, Ohio
Buck, D. M.
American Sheet & Tin Plate Co.
Pittsburgh, Pa.
Dimmick, R. B.
United Alloy Steel Corp.
Canton, Ohio
Richardson, Ernest
Ingram-Richardson Co.
Beaver Falls, Pa.

Cast Iron

Jackson, W. L.
Wolff Mfg. Co.
111 S. Kilpatrick Ave.
Chicago, Ill.
Kahn, B. B.
Estate Stove Co.
Hamilton, Ohio
Manson, M. E.
Rundle Mfg. Co.
Milwaukee, Wis.
Reed, J. C.
Standard Sanitary Mfg. Co.
Pittsburgh, Pa.
Rice, B. A.
Elyria Enameled Products Co.
Elyria, Ohio

Standardization of Tests

E. P. Poste, *Chairman*
513 Park Ave.
Elyria, Ohio
Arnold, H. C.
A. D. Little, Inc.
4020 McRee Ave.
St. Louis, Mo.
Cooke, R. D.
Columbian Stamping & Enameling Co.
Terre Haute, Ind.
Frost, L. J.
Vitreous Enameling Co.
Box 67, Station D
Cleveland, Ohio
Geisinger, E. E.
The Pfaudler Co.
Rochester, N. Y.
Gifford, M. C.
Chicago Hardware Foundry Co.
Chicago, Ill.
Manson, M. E.
Rundle Mfg. Co.
Milwaukee, Wis.
Storey, O. W.
C. F. Burgess Laboratories
Madison, Wis.

Data

T. D. Hartshorn, *Chairman*
U. S. Bureau of Standards
Kensington, Md.
Arnold, H. C.
A. D. Little, Inc.
4020 McRee Ave.
St. Louis, Mo.
Hansen, J. E.
Mellon Institute
Pittsburgh, Pa.

Standardization of Products

D. F. Riess, *Chairman*
The Vollrath Co.
Sheboygan, Wis.
Blackburn, C. A.
Cleveland Metal Products Co.
Cleveland, Ohio
Cox, H. N.
Central Stamping Co.
48 Woodland Ave.
Glen Ridge, N. J.
DeWitt, Bert G.
Belmont Stamping Co.
New Philadelphia, Ohio
Keehn, C. C.
Lisk Mfg. Co.
Canandaigua, N. Y.

Sweely, B. T.
Baltimore Enamel & Novelty Co.
Box 34
Baltimore, Md.

Membership

Karl Türk, *Chairman*
116 W. Hamilton Ave.
Baltimore, Md.
Dwyer, Emmet
Michigan Stove Co.
Detroit, Mich.
Hansen, J. E.
Mellon Institute
Pittsburgh, Pa.
Hodek, F. E.
General Porcelain Enameling Co.
Chicago, Ill.
Jaeger, F. G.
Superior Enameled Products Co.
10th & Mullanphy Sts.
St. Louis, Mo.
Landrum, R. D.
Vitreous Enameling Co.
Grant Ave.
Cleveland, Ohio
Roadhouse, Robert
Benjamin Electric Co.
Des Plaines, Ill.
Smoot, C. E.
American Enameling & Stamping Co.
1900 Santa Fé Ave.
Los Angeles, Cal.

Special Committees

Enameling Furnaces for Sheet Metal Wares

Sweely, B. T., *Chairman*
Baltimore Enamel & Novelty Co.
Baltimore, Md.
Agge, Franklin
Republic Metalware Co.
Buffalo, N. Y.
Bittner, A. G.
National Enameling & Stamping Co.
Box 1400, Central Sta.
St. Louis, Mo.
Blackburn, C. A.
Cleveland Metal Products Co.
Cleveland, Ohio
Clarke, A. E.
Benjamin Electric Co.
Des Plaines, Ill.
Cox, H. N.
48 Woodland Ave.
Glen Ridge, N. J.
De Witt, Bert G.
Belmont Stamping Co.
New Philadelphia, Ohio
Geuder, George
38 15th Ave.
Milwaukee, Wis.
Hogenson, Wm.
Chicago Vitreous Enameling Co.
1421 S. 55th St.
Cicero, Ill.
Sanders, J. W.
U. S. Stamping Co.
Moundsville, West Virginia
Swift, Geo. C.
Enamel Products Co.
2029 E. 115th St.
Cleveland, Ohio
Taylor, Royal
Canton Stamping & Enameling Co.
707 12th St. N. W.
Canton, Ohio
Türk, Karl
116 W. Hamilton Ave.
Baltimore, Md.
Vollrath, J. C.
The Vollrath Co.
Sheboygan, Wis.

Enameling Furnaces for Sanitary Wares

Mahoney, Frank B., *Chairman*
Crane Enamel Ware Co.
Chattanooga, Tenn.
Arrott, A. J.
U. S. Sanitary Mfg. Co.
Pittsburgh, Pa.
Bowman, W. J.
Trenton Fire Clay & Porcelain Co.
Trenton, N. J.
Barnes, T. R.
Barnes Mfg. Co.
Mansfield, Ohio
Ebinger, Jr., D. H.
Ebinger Sanitary Mfg. Co.
735 Linwood Ave.
Columbus, Ohio
Kelley, J. A.
Iron City Sanitary Mfg. Co.
1514 Oliver Bldg.
Pittsburgh, Pa.
Kohler, W. J.
Kohler Co.
Kohler, Wis.
Ludlum, B. A.
Union Sanitary Works
Noblesville, Ind.
Manson, M. E.
Rundle Mfg. Co.
Milwaukee, Wis.
Nye, C. P.
Conemaugh Iron Works
Blairsville, Pa.
Tafel, Theodore, Jr.
Standard Sanitary Mfg. Co.
551 Preble Ave., N. S.
Pittsburgh, Pa.
Wassman, L. G.
Wolff Mfg. Co.
3320 Diversy Ave.
Chicago, Ill.

Enameling Furnaces for Wet Enamel for Cast Iron

Lindemann, W. C., *Chairman*
A. J. Lindemann & Hoverson Co.
Milwaukee, Wis.
Adams, L. A.
Mansfield Vitreous Enameling Co.
Mansfield, Ohio
Bridge, L. D.
Bridge & Beach Mfg. Co.
St. Louis, Mo.
Coulston, E. V.
Rock Island Stove Co.
Rock Island, Illinois
Cushman, H. D.
819 Finance Bldg.
Cleveland, Ohio
Luepke, Emil
Quick Meal Stove Co.
St. Louis, Mo.
Munroe, L. J.
912 Colborne St.
London, Ont., Canada
Roberts, F. G.
Porcelain Enamel & Mfg. Co.
Baltimore, Md.
Walton, W. E.
American Stove Co.
St. Louis, Mo.
Wells, R. D.
Floyd-Wells Co.
Royersford, Pa.

Smelting Furnaces and Smelter Linings

Manson, M. E., *Chairman*
Rundle Mfg. Co.
Milwaukee, Wis.
Bittner, A. G.
National Enameling & Stamping Co.
Central Sta., Box 1400
St. Louis, Mo.

Davis, H. E.
Northwestern Terra Cotta Co
Chicago, Ill.
Tafel, Theodore Jr.
Standard Sanitary Mfg. Co.
551 Preble Ave., N. S.
Pittsburgh, Pa.
Wassman, L. G.
Wolff Mfg. Co.
3320 Diversy Ave.
Chicago, Ill.
Williams, W. G.
Coonley Mfg. Co.
Cicero, Ill.

DRY GRINDING MILLS AND LININGS

Tafel, Theodore, Jr., *Chairman*
Standard Sanitary Mfg. Co.
Pittsburgh, Pa.
Kohler, W. J.
Kohler Co.
Kohler, Wis.
Ludlum, B. A.
Union Sanitary Works
Noblesville, Ind.
Mahoney, F. B.
Crane Enamel Ware Co.
Chattanooga, Tenn.
Nye, C. P.
Conemaugh Iron Works
Blairsville, Pa.
Wassman, L. G.
Wolff Mfg. Co.
3320 Diversy Ave.
Chicago, Ill.

DR. NAVIAS RECEIVES APPOINTMENT

Dr. Louis Navias has been appointed special expert in ceramics and optical glass by the United States Tariff Commission, the work to be carried on under the direction of Dr. Karl Langenbeck. Dr. Navias received his degree of doctor of philosophy in ceramics in January from the University of Illinois. His graduate work was completed under the direction of Dr. E. W. Washburn.

OBITUARIES

News of the death of Dr. C. W. Waggoner, head of the department of physics at the University of West Virginia, Morgantown, W. Va., has been received in the Secretary's office. Dr. Waggoner was thrown from his horse, sustaining a fractured skull. At the time of his death, October, 1922, he was on a year's leave of absence from the University doing research work in connection with the United States Plate Glass Company at Shreveport, La.

Chauncey William Waggoner was born in Rock Bride, Ohio in 1881. He received the degree of M.S.E.E. from Ohio University in 1904, A.M. degree from Cornell in 1905 and Ph.D. from Cornell in 1909. Since 1909 Dr. Waggoner had been professor of Physics at the University of West Virginia. Through his notable work on light, magnetism and the manufacture of glass he became well known in scientific circles and his writings have appeared frequently in scientific journals of the country. He was assistant commissioner of weights and measures of West Virginia, consulting engineer for a number of glass manufacturing plants and among scientific societies he was a member of Sigma Xi, the AMERICAN CERAMIC SOCIETY and the American Association for the Advancement of Science.

His death is greatly to be regretted and he will be missed from his place as a man of science as well as a useful citizen.

Nathaniel Wright Lord, Jr.

Nathaniel Wright Lord, Jr. died on April 8, 1923 at Mt. Carmel Hospital, Columbus, Ohio, after an illness of three months' duration. Mr. Lord, who was twenty-three years of age was a third-year student in the department of Ceramic Engineering at Ohio State University. During the years 1920 and 1921 he was employed by the American Encaustic Tiling Company at Zanesville, Ohio. In 1918 Mr. Lord was a member of the Student Army Training Corps at Ohio State University. He is survived by his mother, Mrs. N. W Lord of Columbus, Ohio and two brothers, James O. Lord, instructor in metallurgy, and Leland L. Lord, a first year student in the College of Arts,

both at O. S. U. He was a son of the late Prof. N. W. Lord of Ohio State University. For the past two years, Mr. Lord had been an associate member of the AMERICAN CERAMIC SOCIETY.

NOTES AND NEWS

RESEARCH ORGANIZATION OF THE NATIONAL LIME ASSOCIATION

BY M. E. HOLMES

Within recent years the uses of lime in chemistry, construction and agriculture have taken on such an increasingly technical aspect that the lime industry today is one of our highly technical industries especially in regard to chemical engineering. The use of lime in agriculture involves a detailed application of the principles of agronomy and chemistry. The use of lime in construction has ceased to be the rule of thumb proposition that it was in the past and demands are now being made for scientifically produced lime products and technically controlled building operations. The use of lime for chemical purposes which has grown with remarkable rapidity during recent years has made new demands upon the lime industry for technical information regarding the fundamental properties and utility of lime and the many details of its adaptability to the varied and numerous chemical functions in modern manufacturing and sanitary engineering processes.

The lime industry has met these demands by establishing a research organization with headquarters at 918 G Street, N. W., Washington, D. C. The lime industry recognizes that all the lime producing companies have a common interest in furthering and developing the knowledge of lime and its uses and also recognizes that this work can best be done by a common central research organization instead of each company attempting to do it individually in which case there would be inadequate facilities and wasteful duplication.

MAJOR E. HOLMES, PH.D., Chemical Director, National Lime Association.

The research organization of the National Lime Association consists of a central laboratory in Washington, and fellowships at Universities and government laboratories under the direction of Dr. M. E. Holmes, Chemical Director. In addition, coöperative research relations are maintained with the laboratories of industrial plants, universities and other research agencies.

The central laboratory at Washington is concentrating on the fundamental properties of commercial limes. Samples of limes from nearly every lime plant in the country are being studied with the object of getting as complete information as possible on all their fundamental properties, such as density, porosity, characteristics in suspensions, chemical reactivity toward solids, solutions and gases, etc. These data have a bearing upon practically every industrial use of lime.

Other problems under way in the central laboratory are the development of new uses for lime, a study of improvements in the quick-setting properties of lime mortar, the

preparation of ready mixed plaster, the study of lime as a causticizing agent, the development of improved aqueous lime paints and the solving of problems encountered by the users of lime.

The Association maintains a fellowship at Ohio State University where Prof. J. R. Withrow is coöperating in directing an extensive study of the burning of various typical limestones under various conditions of time and temperature to determine the effect of these conditions upon the properties of the lime for construction and chemical purposes.

The Association maintains a fellowship at Indiana University where Prof. F. C. Mathers is coöperating in directing research on the effect of admixtures upon the hardening properties of lime mortar, the manufacture of special lime products, such as peroxides, the study of lime as a dehydrating agent, polishing agent, etc.

The Association also maintains a fellowship at the Bureau of Standards at Washington, D. C., where Mr. Warren E. Emley is coöperating in the direction of work designed to improve the uses of lime primarily for construction purposes. This work is primarily along the line of improved lime products and improving the use of lime products. Unlike the other research activities of the Association the work at the Bureau of Standards under the direction of Mr. Emley has been in progress a number of years and the valuable results that have been achieved are well known. The agricultural department of the Association also maintains a fellowship at the University of Tennessee.

The Association will also establish at least one more university fellowship to work upon problems in the chemical and construction uses of lime but the place has not been decided upon at this writing.

Coöperative research relations are maintained with several universities, especially Cornell and Massachusetts Institute of Technology, which have departments interested in lime research for their post-graduate students, whereby they render valuable service to the lime industry and at the same time the arrangement provides the researcher with a most fertile field of study.

The main idea back of the research organization is service, service to the user of lime whereby the use of lime can be extended and enlarged upon a thoroughly sound and scientific basis. The results of the research will be given the widest possible publicity in the form of magazine articles, and bulletins and will serve as the background for the various activities of the association, such as standardization and field promotion work.

ENGINEERS, SCIENTISTS, AND EDITORS PLAN TO STANDARDIZE SYMBOLS AND ABBREVIATIONS

A recent conference held in New York City under the auspices of the American Engineering Standards Committee revealed a sentiment among engineers, scientists, government officials, business paper editors, and industrial executives, emphatically in favor of the unification of technical and scientific abbreviations and symbols.

It was agreed on all sides that the standardization of abbreviations and symbols would result in inestimable mental economies. The present situation with respect to the use of abbreviations and symbols in engineering, scientific, and other technical fields is comparable to a language which has degenerated into a multiplicity of dialects each of which has to be translated for the users of the others. Abbreviations and symbols constitute an ever growing and important part of the language of engineers, scientists, industrial editors, and other technical men. The use of one symbol or abbreviation for several different terms and the use of several different symbols or abbreviations for one meaning are, however, at present causing a great deal of confusion, misunderstanding, and, often, serious errors.

The conference was called upon requests from the American Institute of Electrical

Engineers, the American Society of Mechanical Engineers, and the Association of Edison Illuminating Companies, to consider abbreviations and symbols, but after some discussion of the subject it was thought desirable to include as a part of the project, the graphical symbols which are used in engineering drawings, diagrams, and the like, for representing instruments and apparatus and components of them.

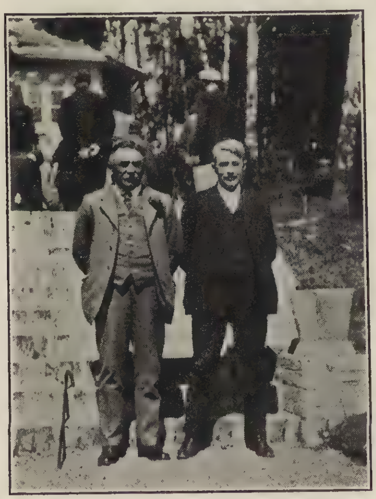
It was agreed that the coöperation of foreign standardizing bodies should be sought, in the development of the work. The importance of international uniformity in symbols is great on account of the international character of much engineering and scientific work, and the importance of reference books and periodicals in foreign languages.

The work will go forward under a committee organization developed in accordance with the rules and procedure of the American Engineering Standards Committee.

THE CERAMIC SOCIETY

By James A. Audley

The volumes of the *Transactions* of the North Staffordshire Ceramic Society, the precursor of the Ceramic Society in England, contain no official record of the foundation of the Society or of its earliest meetings. The first volume relates to proceedings in the session 1901–2, and it was somewhat hastily assumed that this must have corresponded with the first year of the Society's existence. Accordingly, in hurrying to complete and dispatch the brief notice for insertion in the *Journal of the American Ceramic Society*, January, 1923, the Society was stated to have been established in 1901. Some doubt having arisen, the writer determined to make a careful search in contemporary publications of 1900 and 1901, and definitely ascertained that the actual formation of the Society took place in the autumn of 1900. Several meetings were held, but, apart from summarized reports in the press during this time, no authoritative account of the work of the first session was published, the first volume of the *Transactions* issued being concerned with the second session.



Dr. J. W. Mellor (right) and Sir Wm. J. Jones, K.B.E. (left) at Mr. Odelberg's house at Gustafsberg.

It should have been mentioned that Mr. Henry Watkin was the second president succeeding Mr. W. Burton and preceding Mr. B. Moore.

ASSOCIATION OF CENTENARY FIRMS OF THE UNITED STATES

This is an association of firms which are now being managed by direct descendants in the male line from the founders of the concerns one hundred years old. The present roster contains eighty-one concerns.

Mr. Burnet Landreth of the D. Landreth Seed Company, Bristol, Pa., wishes to learn of the ceramic concerns which have been managed continuously for one hundred years by direct male descendants of the founders of the business.

Ten of the concerns on the roster of the Association of Centenary Firms have so

changed the management that none of the direct descendants of the founder remain in the administration of the firms affairs although for one hundred years their management has been directed by direct male descendants.

It is estimated that probably there are not a half dozen concerns in addition to the eighty-one establishments in the United States that are eligible for membership.

A. H. Hews and Co., Cambridge, Mass., and Whitney Glass Works, Glassboro, N. J., are the only centenarians listed from the ceramic industries. Do you know of others?

NOTES FROM THE U. S. BUREAU OF MINES

Oxidation of Ceramic Wares during Firing

A study of the chemical and physical changes taking place in clay bodies during firing is under way at the ceramic experiment station of the Bureau of Mines, Columbus, Ohio, and will be continued during the coming year since a better understanding of the reactions taking place in a ceramic kiln is essential before many of the problems confronting the ceramic industry can be solved.

Much fundamental information of a laboratory character has been obtained as to the oxidation of iron, sulphur, and organic material at all stages in the firing. A paper by Bole and Jackson containing data on the rate of evolution of SO_2–SO_3–H_2O–CO_2 from a fire-clay body at varying temperatures in an atmosphere of oxygen is in course of preparation. This is the first of a series of papers to appear giving results of this work. A study of the effect of varying the bathing atmosphere within kiln limits will now be made. It is proposed later to investigate the problem along similar lines on industrial kilns.

After sufficient fundamental data has been obtained, it is proposed to investigate the several special problems which have arisen in the field in connection with the co-operative work with the four Heavy Clay Products' Associations. These problems include among others (*a*) the possibility of removing sulphur fumes from kiln gases so that they may be run directly through dryers, (*b*) the cause and prevention of red core in buff face brick, (*c*) an explanation of the so-called "blue smoke" and its influence on oxidation, (*d*) the cause and prevention of slabbing or popping of ware from siderite bearing clays.

Dolomite and Magnesite Refractories

Before the best results can be obtained from dolomite as a refractory, certain fundamental data not yet available must be at hand. Since previous work has indicated that highly aluminous fluxes together with a small percentage of the sesqui oxide of iron are the most desirable for the dead burning of dolomite, the problem is being studied systematically at the Ceramic experiment station of the Bureau of Mines.

Phase rule diagrams for three component systems are being worked out in order to find the non-slaking areas using varying percentages of the flux. The system has been completed using 10% flux and it is planned to continue the work using 5–15–20 and 25% flux. The aluminous flux used is a bauxitic clay and the iron oxide may or may not have to be added depending upon the per cent present in the clay.

The material used up to the present has been a dense Niagara dolomite, but a highly crystalline stone such as that obtained near Gouverneur, N. Y. will later be tried out. Using the information obtained from the one diagram already completed, some good bricks have been made but much more is anticipated after the whole field has been covered.

Investigation of the System ZrO_2–TiO_2–SiO_2

The metallurgical field is constantly demanding a refractory material which will stand up under more severe heat conditions, states the Bureau of Mines. There are many other demands on a refractory for specific utilization, but it must be primarily a material with a high softening point. The refractory further must not vary widely in acidity or basicity from the slag with which it comes in contact. With these considerations together with that of economy in view, it is apparent that there are only a very few materials available for the purpose. It is proposed by the Bureau of Mines therefore to start work on the system ZrO_2–Al_2O_3–SiO_2 with the object in view of obtaining fundamental data in regard to refractories, abrasives and quartz glass. The purification of the ZrO_2 has already been completed. An induction furnace in which temperatures up to 3000°C can be attained is being installed for this and similar work at the Ceramic experiment station at Columbus, Ohio.

CLOSER COÖPERATION BETWEEN GOVERNMENT AND INDUSTRY IN STANDARDIZATION WORK

Another important step toward the elimination of differences between specifications for government purchases and specifications for similar materials produced for the general commercial market, was taken at the March meeting of the American Engineering Standards Committee, when it was voted to accede to the suggestion of the Federal Specifications Board that the A.E.S.C. submit to the Board for its information all standards which are being considered by the A.E.S.C. for approval. In cases where standards before the A.E.S.C. prove also of interest to any government department, the matter of their formal approval as government standards may then be considered by the Federal Specifications Board.

The Federal Board has for some time used the machinery of the American Engineering Standards Committee to bring its specifications into harmony with the best commercial practice, thereby broadening its source of supply and lessening the cost of production. Under this arrangement twenty-two specifications for government purchases have already been submitted to industry for criticism in advance of their adoption by the Federal Specifications Board.

Through the presence of seven departments of the federal government in the membership of the American Engineering Standards Committee the government has participated in the formulation of industrial standards. Now industry has an opportunity to participate, as an advisor, in the formulation of government standards, thus minimizing the possibilities of duplicated effort in the field of standardization.

MINUTES OF THE ELECTRICAL PORCELAIN SECTION, ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES

A regular meeting of the Electrical Porcelain Section of the Associated Manufacturers of Electrical Supplies was held at the Wm. Penn Hotel, Pittsburgh, Pa. on Wednesday, December 13th, 1922.

Invitations to attend the meeting were extended to every manufacturer of electrical porcelain, the object being to acquaint the entire industry with the advantages possible through association membership.

ROLL CALL

Brunt Porcelain Co.	Geo. F. Brunt
Cook Pottery Co.	Paul G. Duryea
Federal Porcelain Co.	R. G. Spencer
Hartford Faience Co.	F. L. Bishop
Imperial Porcelain Works	B. B. Dinsmore
Locke Insulator Mfg. Co.	B. A. Plimpton
Westinghouse Hi-Voltage Ins. Co.	Geo. I. Gilchrist
Star Porcelain Co.	F. F. Gardinor
R. Thomas & Sons Co.	J. E. Way
	H. R. Holmes

and by special invitation the following non members:

American Porcelain Co.	W. J. Curry
Colonial Insulator Co.	Jas. R. Hemphill
Carey Ohio Porcelain Co.	W. D. Wooley
Davidson Porcelain Co.	W. Davidson
Findlay Elec. Porcelain Co.	J. V. Patterson
General Porcelain Co.	W. S. Cook
Specialty Porcelain Works	J. W. Boch
Standard Porcelain Co.	Harry Yates
Summit Porcelain Co.	Anthony Comfort
Trumbull Elec. Mfg. Co.	J. M. Gilfillan
Trenle Porcelain Co.	G. A. Trenle
	H. W. Blake
Union Electrical Porcelain Works	J. Mackenzie
West Virginia Porcelain Co.	Dr. Ferrell

The meeting was called to order by the Chairman, Mr. J. E. Way at 10:30 A.M. Mr. Duryea explained briefly the call for the meeting after which the Chairman introduced Mr. S. L. Nicholson, President of the A.M.E.S. Mr. Nicholson who is also Chairman of the Electrical Manufacturers Council, reviewed the history of the Council, and described very clearly the procedure of its various committees in handling matters of vital interest to the Electrical Manufacturing industry. Among those especially mentioned was regulatory legislation and ordinances proposed by State and Municipal authorities affecting the electrical industry, and it was convincingly shown that when such proposals threaten the rights of Manufacturers of Electrical Supplies and Apparatus and are unjust in their application that the best means of defense is offered by the co-operative methods of the Association. This talk by Mr. Nicholson which is very briefly reported in these minutes occupied about two hours time and without question marked the meeting as the most interesting and instructive ever held by the Section. Acknowledgment was expressed by a rising vote of thanks. Mr. Duryea emphasized the fact that the machinery for handling all matters of general interest to the Porcelain Section requiring any action by the Council was in full operation and available to its members.

The expense of membership was explained and application blanks distributed. Applications for membership from The American Porcelain Company, The Summit Porcelain Company, Inc., The Trenle Porcelain Co. and the W. Virginia Porcelain Company were filed with the Secretary, and the discussion following the remarks of Mr. Nicholson encouraged the belief that other applications will result. The meeting adjourned for lunch at 1 P.M., after which the Section proceeded with the regular order of business.

CALENDAR OF CONVENTIONS

American Association of Engineers—Norfolk, Va., May 7 to 9.

American Dental Trade Association—Spring Lake, N. J., June, 1923

American Electrochemical Society—Commodore Hotel, N. Y., May 3, 4, 5.

American Face Brick Association—First Week in December, 1923.

American Face Brick Association (Southern Group)—West Baden, Ind., November, 1923.

American Gas Association—Atlantic City, Week of Oct. 15, 1923.
American Institute of Chemical Engineers—Wilmington, Del., June 20–23, 1923.
American Society of Mechanical Engineers—Montreal, Can., May 28–31.
American Society for Testing Materials—Chalfonte-Haddon Hall Hotel, Atlantic City, June 25, 1923.
American Zinc Institute—St. Louis, Mo., May 7 and 8, 1923.
Canadian Institute of Chemistry—Toronto, Can., May 29 to 31, 1923.
Chamber of Commerce of the United States of America—New York City, May 8–10, 1923.
Clay Products Association—Chicago, Ill., Third Tuesday in each month.
Dental Manufacturers' Club of the United States—Spring Lake, N. J., June, 1923.
Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18, 1923.
Iron and Steel Institute (London)—House of the Institution of Civil Engineers, London, S. W. 1, May 10 and 11, 1923.
Manufacturing Chemists' Association—New York, June, 1923.
National Association of Manufacturers of the United States—Waldorf-Astoria Hotel, New York City, May 14 to 16, 1923.
National Association of Stove Manufacturers—Richmond, Va., May 9, 1923.
National Association of Window Glass Manufacturers—Place and date not determined.
National Board of Fire Underwriters—New York, May 24, 1923.
National Exposition of Chemical Industries (Ninth)—New York, Sept. 17 to 22, 1923.
National Foreign Trade Council—New Orleans, La., Postponed from April to May 2, 3 and 4.
National Gas Appliance Manufacturers' Exchange—Kansas City, Mo., May, 1923.
National Lime Association—Hotel Commodore, New York City, June 13 to 15, 1923.
National Paving Brick Manufacturers' Association, December, 1923.
National Symposium on Colloid Chemistry—University of Wisconsin, June 12 to 15, 1923.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Society of Chemical Industry (Canadian Section)—Toronto, Can., May 29 to 31, 1923.
Stoker Manufacturers' Association—May or June, 1923.
Society for Steel Treatment (Eastern Section)—Bethlehem, Pa., June 14 and 15, 1923.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Vol. 2 | **June, 1923** | **No. 6**

PRESIDENT'S PAGE

It is not too early for the members of the SOCIETY to plan their summer vacations and it is the earnest desire of the officers that consideration be given this year to the Annual Summer Meeting as a means of spending a most delightful holiday with fellow ceramists to the Detroit district. The trip last year to Canada was a splendid success and much enjoyed by all those who attended.

The trip is planned for August 8, 9, 10, 11, and will consume four days. The itinerary with full details will be mailed to you shortly. Will you not plan to attend and bring the entire family? The ladies add so much to the pleasures of a trip of this kind.

The Committee appointments have now been made and it is sincerely hoped that all Committees will continue to function during the entire year. There is a tendency to drop Committee work during the summer months and leave most of the work until fall which leaves only a short period before the Annual Meeting. Due to vacations it is sometimes hard for a Committee Chairman to get action during the summer, but it is hoped that each Chairman will outline his work for the year and get these outlines into the hands of members of the Committee so that some thought may be given to the details during the next few months. Action will be so much easier to get in the early fall if this is done. As so much more can be accomplished if the Committees can get together during the year, will not each Chairman attempt to get at least some members of his Committee to attend the Sum-

mer Meeting? More real work can be accomplished on this trip in a few days than is possible in months through correspondence.

Practically all of the Divisions are now organized and their Committees should also begin to function. It is not too early for the Committee in charge of Papers and Programs to begin solicitation for papers for the Atlantic City Meeting. It is so much easier at this time to obtain promises of papers than if the matter is left until a month or two before the Annual Meeting.

Few members realize how splendidly the Society is beginning to function as a consulting agency. It is surprising the number of requests for information, both from members and non-members, which are sent in to the Secretary's office. These requests vary from the composition of glaze to men to fill positions in ceramic plants. Fortunately our versatile General Secretary is able to give the required information in almost every case without reference to other members, but when he is not able to do so members can always be found who are willing to give the requested assistance.

EDITORIALS

PIONEERING BEYOND THE RIM[1]

Editor's Note.—We are indebted to the Editor of *Saturday Evening Post* for permission to reprint these paragraphs taken from a most excellently written and illustrated article on the value of industrial research. The reproduction of these paragraphs here is to give emphasis to the truths in them enunciated.

The nation that leads the world in business and commerce must lead also in research. Success today depends more on mental than material equipment. The vital need of the moment in America is for an additional 10,000 highly trained scientific investigators, each of whom may be used as a teacher or nucleus of research groups. Only in such a way can we effectively remedy waste, improve government, and rapidly develop the basic art of industrial chemistry. If we let other nations excel in research we must concede to them important advantages and be content to play a minor rôle in world affairs.

We have heard much talk about preparedness. Many people call attention to the fact that the earth has been in an almost constant state of war for 10,000 years. The truth is, that active, increasing research is the very best type of preparedness, not only for national defence but for industrial peace. The uncovering of buried treasures of new knowledge is the most effective way for a people to strengthen themselves.

When a nation stops discovering new things we have the first sign of sure decay. Though progress in research in the United States has been slow, it nevertheless is clearly evident. More than 1300 American companies have laboratories and about 10,000 men and women are employed in them. Most of our corporations engaged in scientific investigative work have linked up with governmental agencies, trade and technical organizations and universities, in a systematic effort to increase the speed of actual accomplishment through an interchange of ideas.

But though we have laid the foundation for a broad campaign of national research, the effort so far made represents only the first feeble steps of an infant industry. Dozens of great corporations continue to pay $100,000 a year for legal advice and $10,000 for scientific guidance. Most of these companies are run by executives who lack the ability to keep one jump ahead of their competitors on the modern plan of inviting inspection and therefore they endeavor to cover up their incompetence by resorting to the locked door and sharp practice. Industrial secrecy has done more than all else to retard coöperative research.

Thanks to some of our progressive leaders, and especially to our trade associations, the rank and file of American manufacturers are beginning to understand what research is, how much it costs, and why it pays. They have come to know that it is a mistake to rely upon governmental agencies to carry on scientific work that is designed to better their own particular business. They have learned that coöperation in research is absolutely essential, and that it is possible to improve life and yet make a profit on the operation.

If there is anyone who does not believe in the wisdom of having business and science coöperate for their mutual advantage, then a brief study of the industrial progress throughout the world in recent years should convince him.

It has been only a comparatively short time since we commenced to manufacture cement, and yet the use of concrete made of cement, with water and aggregate, is increasing in an amazing way. The infant cement industry grew so fast that the manufacturers

[1] Floyd W. Parsons (*Saturday Evening Post*, May 5, 1923).

had very little time to give to a scientific study of their product, and the result was a succession of failures in many construction jobs where concrete was used. Then the cement people decided to go in for research, and almost immediately the new knowledge developed served to put the industry on a basis of stability that did not exist before. Experiments were carried on to show what quality of concrete is most economical in certain lines of construction. Tests were established so that everyone might determine the suitability of available aggregates. Rules were formulated for proportioning, mixing and placing the material. Experiments were completed to show the effect of changes in the proportions of materials, and of the exposure to wear and weather. For years people who mixed concrete assumed that the only materials of importance were the cement, sand and pebbles or crushed stone. A short time ago the research workers obtained revolutionary results by proportioning the water in the concrete mixes. Now we know that the amount of water used is nearly as important as the solid materials, and today the cement industry is of a single mind with respect to the value of coöperative research on a national scale.

. . . . . The up-to-date executive lays out his research under five heads: First is the research to improve his everyday methods; second, research aimed at a specific commercial object; third, pure-science research, which has no immediate industrial object in view; fourth, research applied to public service, or investigations designed to study the needs of the consumer, and to analyze the fields of use of a manufactured product; fifth, there is research in standardization of procedures and products.

The sooner we all recognize the earning power of research, the sooner we shall get on a highway leading to a state of prosperity that will be far more satisfactory and permanent than any we have ever yet enjoyed. One manufacturer was wasting $100,000 a year on raw materials purchased without regard to moisture content. Now he has learned the importance of the accurate control of moisture. On one railroad the boiler tubes of switch engines had an average life of seven months. It cost $1200 to replace a set of tubes. Research has extended the life of the tubes to thirty-one months, and the company has 1600 locomotives. A large gas company uses 3500 barrels of gas oil a day. The management recently spent $350,000 in developing a cracking process all their own. As a result they now get a 27 per cent yield of gasoline out of each barrel of oil. The remaining oil is 7 per cent better for their purpose than it was before the gasoline was removed. As a result of this research the company is saving $1.24 on each barrel of oil, or $4,340 daily. Here is a scientific achievement that pays 100 per cent interest every eighty days.

A great many people are coming to believe that it is safer and better to judge the future of a corporation or an industry by its fixed attitude toward research than by its working capital, its past earning power or its fixed assets. Scientific investigation is the only wise and economical way to stop waste and indefinitely postpone the exhaustion of our natural resources.

FRANK P. JUDGE'S STATEMENTS OF VALUE OF INDUSTRIAL RESEARCH

At the annual meeting of the United States Potters' Association held in New York City in April, Frank P. Judge, Jr., president of the Association was among the prominent speakers for the occasion. A part of his address of especial interest to the members of the AMERICAN CERAMIC SOCIETY is reprinted from the *Evening Review*, of East Liverpool, Ohio.

"For years our forefathers toiled along as best they could contenting themselves with the results they obtained under adverse manufacturing conditions but the progress of time and the demand from the consumer made it imperative for us to give thought and attention to the improvement of our product. The full significance of this did not dawn upon us until importations of foreign dinner ware were curtailed by reason of the recent World War which practically put all manufacturing at a standstill, exclusive of such as was necessary to the conduct of the war and to provide the actual necessities of the people. The American potter was not slow to realize that his opportunity was at hand and the past few years have seen many changes in our manufacturing processes. We are proud of the fact that our products today are far superior in body, glaze, art and design than they were a few years ago.

"We must not stop with our accomplishments of today but we should exert every effort to continue the perfection of our wares so that we shall eventually be able to supply all the demands of our home consumption and, in addition, develop an export trade. To do this we cannot follow along the same lines as we did years ago encountering difficulties and not knowing how to overcome them other than to work all angles on the problem until it was solved—consequently we were still in the dark as to the cause of the trouble.

"It is a well known fact that the progressive industries of today do not rely upon past experience handed down from generation to generation but are solving their manufacturing problems in their research laboratories with technically trained men, spending their time studying ways and means to reduce losses in the course of manufacture, better and more economic methods, testing materials and lastly, but not least, the betterment of the product. A few of our largest potteries are now maintaining their own research laboratories and look upon them as one of their most valuable assets. A smaller pottery needs the service of the technical man just as much as the large one but the needs of the small pottery hardly justify the maintenance of a research department. To take care of the small potteries it is suggested that a research laboratory be established at a central point (in the name of the United States Potters' Association) which would be in charge of a Ceramic Engineer whose service would be available to any member of our association at any time, the member paying for the individual service he would receive. When not engaged in doing work for an individual factory the ceramic engineer could be conducting experiments, studying raw materials, methods of firing, fuels, etc. It is my sincere hope that before this meeting adjourns some action will have been taken *on this matter. Our industry is expanding and the work of our Association should expand with it.*

"At the last annual meeting a new committee was created. It is known as our research committee and in the short space of time it has been functioning, much valuable information has been furnished our members. The outstanding feature of the work of this committee during the past year was to interest the United States Bureau of Standards in working out some of our problems. On October 27th, 1922 a fellowship was established at the Bureau to work on one of our greatest problems—that of crazing. A ceramist is now making a systematic study of this and we are looking forward to receiving an interesting report from this fellowship later on in our program. In addition to working on the crazing question the Bureau is also experimenting with sagger clays to determine which clay or combination of clays will give us a sagger better than what we are now using.

"Considerable assistance can be given to the Research Committee by the kiln and fuel also the machinery committees by providing confidential and reliable reports on such subjects that would come under the work of the respective committees.

"Each succeeding year is finding a decided improvement in the artistic side of our

business and before very many more years pass into history the evil of imitating shapes, decorations, etc., will be stamped out.

"Each factory should put individuality into its product and the sooner we come to the realization of this just that much sooner will the keen competition of the past be eliminated. To stimulate activity along the line of originality in shapes and decorations a prize could be given each year by the United States Potters' Association to the individual suggesting the best designs for dinner services and to the decorator or artist offering the best suggestions for decoration.

"We might not feel the necessity of serious consideration of this subject at the present time but we must not forget that there is a day coming when everything is not as favorable as it is now and that will be the time when the product of fine quality, originality in shape and decoration will not need to fear competition, either foreign or domestic.

"You supply dealers can be of valuable assistance in carrying on this work. The best materials obtainable should be brought to our attention and the decalcomania dealers could assist by refusing to make decorations which they know are already on the market and by keeping their lines free of decorations that are similar in design and appearances. This would not benefit the potter alone, but should materially benefit the decalcomania manufacturers. I cannot urge upon you too strongly to give serious thought to this side of our business. Let each one of us leave this meeting with a firm resolve to make our respective products original and recognizable by their individuality."

SCIENTIFIC RESEARCH ENTERS NEW ERA

Activities of Engineer Organizations

Scientific research, affording new channels for the aspirations of the engineer, is entering upon a new era both here and abroad. Following the $500,000 gift of Ambrose Swasey of Cleveland, making possible the organization of Engineering Foundation, comes news from London that Sir Alfred Yarrow has given the same amount to the Royal Society for the same purpose.

The philanthropy of Sir Alfred, who is an honorary member of the American Society of Mechanical Engineers, is characterized as another step toward the identity of effort which engineers and men of science are striving to accomplish throughout the Anglo-Saxon world.

"I should like to record my firm conviction that a patriotic citizen cannot give money, or leave it at his death, to better advantage than towards the development of science, upon which the industrial success of the country so largely depends," said Sir Alfred in his deed of gift.

PAPERS AND DISCUSSIONS

REPORT OF COMMITTEE ON STANDARDS[1]

By Walter A. Hull[2]

The Standards Committee wishes to present to the Board of Trustees the accompanying specification for Limestone, Quicklime and Hydrated Lime[3] for use in the manufacture of glass. This specification was prepared by Mr. A. E. Williams for the Interdepartmental Conference on Chemical Lime, which is a conference made up of representatives of interested governmental departments. It has been approved by the Interdepartmental Conference and by the Standards Committee of the Glass Division of the American Ceramic Society and it should be stated in this connection that members of the Glass Division were consulted freely during the preparation of the specification. Subsequent to its approval by the Standards Committee of the Glass Division, slight revisions were made. These revisions were approved by the Interdepartmental Conference. The revised specification was then submitted to letter ballot of the Standards Committee of the American Ceramic Society. This Committee now recommends that the specification be adopted as a Standard of the Society.

Since the various Divisions of the Ceramic Society have been organized, with Standards Committees of their own, the General Committee on Standards has automatically become, in large measure, a coördinating committee. The work of developing tests and preparing specifications for materials which are used or produced by members of one Division only, properly belongs to the Standards Committee of that Division. The duty of the General Committee on Standards in such a case is to give the specification a final inspection before recommending that the Society adopt it as a standard. One of the objects of this inspection by the Standards Committee is to make sure that there is no conflict with and no unnecessary duplication of the specifications submitted by other Divisions. In the case of a material or product of interest to more than one Division, it is a proper function of the General Committee on Standards to act as a clearing house or coördinating agency.

Until within the last couple of years the work of the American Ceramic Society on standards has been almost wholly along the line of methods of testing clays and one or two types of ceramic products. In other words, the standards which have been given a definite status by the Society are almost wholly standard methods for laboratory workers. Very recently, say within the last two or three years, there has been more of a tendency to try to devise suitable specifications for use in the purchase of materials such as feldspar, flint, whiting and limestone which are purchased in quantity by members of the Society. Thus we find specifications pro-

[1] See "Tentative Specifications for Glass House Refractories," *Bull Amer. Ceram. Soc.*, **2** [3], 29 (1923).

[2] Chairman, Committee on Standards. [3] See p. 170, *This Bulletin.*

posed for refractories for glass tanks; feldspar, flint and whiting for the whiteware industry; and limestone, quicklime and hydrated lime for glass manufacture. One of these proposed specifications is now definitely recommended for adoption as a Standard of the SOCIETY. It is expected that the Whitewares Division may approve one of the others at the 1923 Annual Meeting so that it can be considered by the General Standards Committee for presentation to the SOCIETY at the 1924 Annual Meeting. It is hoped that the work already done on specifications for feldspar may be materially supplemented by the coming colloquium, and that satisfactory specifications for feldspar for certain specific purposes may be added to the Standards of the SOCIETY within reasonable time.

There is an opportunity for practically every Division to work on specifications for materials purchased by members of the Division. It is predicted that as one after another of the Standards Committees of the different Divisions begin to give active attention to this work, it will be found that the Divisional Standards Committees need strengthening by adding active, representative members to the personnel of these Committees. In order that the SOCIETY may do constructive work in the preparation of specifications, each Divisional Standards Committee must be so representative that a specification that is put up to a Division for action will represent the best thought obtainable in the Division. In order to work most effectively, it would be necessary for the Divisional Standards Committee to assemble in committee meetings at intervals and work out questions pertaining to specifications. Whenever the group of manufacturers represented in a given Division gets to be "sold" on the value of specifications for the materials purchased or the products sold, it will become possible to secure attendance at such meetings. In the meantime, it is almost a primary essential for every Divisional Standards Committee which is going to function to have a chairman or secretary who can obtain stenographic assistance.

It is believed that suitable specifications for use in the purchase of materials alone will result in a large saving in costs and reduction in factory troubles to members of the SOCIETY. It may not take long for the first specifications put in force to show results, and results will give the movement an impetus quicker than anything else.

THE ANALYSIS OF HIGH ALUMINA PRODUCTS[1]

BY C. A. UNDERWOOD

Introduction

With the recent introduction of refractory products having an alumina content from 60 to 85%, it may prove desirable to discuss the method of

[1] Read before the Refractories Division, Pittsburgh Meeting, February, 1923.

analysis employed with such refractories. In this class are included diaspore, bauxite, spinel and the various products made from these materials.

Considerable detail is given in order that the operator may proceed without the trouble of devising the technic and to help him over the pit falls.

Ordinary clays can be thoroughly decomposed by fusion with sodium carbonate. For diaspore and similar materials either sodium or potassium pyrosulphate must be used. The burnt products can be fused directly whereas the raw material must be calcined to drive off the combined water. Otherwise the diaspore will float on the fusion and crawl up and over the wall of the crucible, causing loss of part of the sample and preventing the remainder from being acted upon by the pyrosulphate. This makes it advisable to determine the loss on ignition first.

"Loss on Ignition"

Exactly one gram of the sample, which has been dried at 105°C for one hour and cooled in a desiccator, is weighed into either a platinum or porcelain crucible and heated for 30 minutes at not less than 1000°C. The ignition may be conducted in an electric furnace or over a good blast, care being taken that all samples receive the same treatment. Different operators may obtain slightly different results owing to differences in the temperature of their blasts. Hence the "loss on ignition" is a somewhat variable determination.[1] Owing to decrepitation it is necessary in some cases to raise the heat gradually.

Solution of the Sample

The sample on which the ignition loss has been determined is transferred from the crucible to an agate mortar and pulverized. An amount corresponding to 0.5000 of the original (crude) sample is then weighed out and mixed with 10 to 15 grams of fused potassium pyrosulphate. To illustrate: Assume the loss on ignition to be 13.50%. Then $\frac{100.00-13.50}{100} \times 0.5000 =$ .4325 gram, the amount necessary to weigh out.

This procedure has two advantages: first, there is time saved, and secondly, the size of the alumina precipitate will be smaller.

The fusion requires about three hours, beginning with a very low flame and gradually increasing until the sample is thoroughly decomposed; a condition which exists when flocculent silica is seen in the melt. If there is any undecomposed material adhering to the wall of the crucible, it can be brought into solution by carefully removing the cover and tilting the crucible so that the melt may act upon it.

[1] W. F. Hillebrand, "The Analysis of Silicate and Carbonate Rocks," U. S. Geol. Surv., *Bull.* **422**, p. 231.

When the fusion has cooled the button is removed from the crucible and the crucible and cover placed in a 400-cc. beaker containing 150 cc. of dilute hydrochloric acid (1—1). Heat gently on the hot plate until crucible and cover are clean. Remove, add the button to this solution and continue to heat until solution takes place. The solution will finally become clear, only the silica remaining undissolved.

Silica

Transfer to a porcelain evaporating dish and evaporate as nearly to dryness as possible. It is impossible to remove the last traces of acid on the water bath, but by occasionally breaking up the crust that forms, very nearly all can be driven off. Dryness is accomplished by supporting the evaporating dish about two inches above the top of a hot plate, care being taken not to heat too rapidly so that spattering takes place. By this means all acid can be removed and the silica dehydrated.

Fifty cc. of dilute hydrochloric acid and 150 cc. of hot water are now added and heat applied until all except the silica is in solution. Filter through a 11 cm. filter paper, receiving the filtrate in a 400-cc. beaker. The silica is washed six times with cold water and six times with hot water, after which it is ignited and weighed in a platinum crucible.

Moisten the impure silica with a few drops of water; add two drops of concentrated sulphuric acid and 10 to 15 cc. of hydrofluoric acid. Evaporate (do not boil) until the sulphuric acid has been expelled, ignite and weigh. The difference in the two weights represents the true silica.

If desirable, the filtrate can be again evaporated to dryness, but this is unnecessary for ordinary work.

Alumina, Iron Oxide, and Titania

The residue from the hydrofluoric acid evaporation usually amounts to 5 milligrams or less and consists of alumina, iron oxide, and titania. It is fused with one or two grams of potassium pyrosulphate and when cold is dissolved in the filtrate obtained from the silica separation. The solution now contains all the constituents to be determined except the alkalies. It is transferred to a 500-cc. graduated flask and filled to the mark. Mix thoroughly and pipette 200 cc. into a 400-cc. beaker.

Pass hydrogen sulphide through the solution for ten minutes or until all the platinum is precipitated. Heat to boiling to coagulate. Filter into a 600-cc. beaker and bring to boil to expel the hydrogen sulphide. Add bromine water to oxidize the iron, and continue to boil until the excess bromine has been driven off. Dilute to 450 cc.

There is an appreciable error caused by the solution of platinum during the pyrosulphate fusion. This must be removed; otherwise the alumina

will be high. It takes considerable time, however, to throw out the platinum with hydrogen sulphide and then reoxidize. For general work, this can be avoided by weighing the platinum crucible before and after the fusion. The loss in weight is then deducted from the weight of the alumina precipitate.

After expelling the bromine, the alumina, iron and titanium are precipitated with ammonia, using rosalic acid as an indicator. It is best to add the last drops of ammonia from a pipette so that the color change can be followed closely. Allow the precipitate to settle and filter through a strong 12.5-cm. filter. Rinse the beaker with hot dilute ammonium nitrate solution to get all on the filter and then wash five times, breaking up the precipitate in order to wash it thoroughly.

Save the filtrate and redissolve the precipitate into the original beaker with hot dilute hydrochloric acid (1−1). Dilute to 450 cc. and precipitate as before. On filtering scrub the beaker clean and wash five times with the ammonium nitrate solution. Save the filtrate.

The alumina precipitation is the most difficult part of this analysis and unless every precaution is exercised, good results cannot be obtained.[1] The precipitate should not be washed with pure water but either with dilute ammonium nitrate or chloride. Also the volume of the solution should not be less than specified. The large amount of fixed alkalies present are adsorbed by the alumina precipitate and are difficult to remove. Pure ammonia, as recommended under "Reagents," is likewise necessary since any error introduced in this way is multiplied many times in the result.

After the alumina precipitate has drained for a short time, it is placed in a platinum crucible of sufficient size and dried; care being taken not to lose any by spattering. It is then ignited, blasted for twenty minutes, cooled in a desiccator and weighed with cover on. A second blasting for ten minutes will show if constant weight has been obtained.

Iron

The combined oxides of aluminum, iron and titanium are fused with ten grams of fused potassium pyrosulphate, exercising all the precautions necessary in pyrosulphate fusions. When all has been dissolved allow the fusion to cool. Remove the button to a watch glass by gently tapping and place the crucible and cover in a 150-cc. beaker. Add 75 cc. of water and 10 cc. of conc. sulphuric acid. Heat gently until the crucible and cover are clean. Remove and add the button to this solution. Continue to heat gently until the fusion is completely dissolved and transfer the solution to a 500-cc. Erlenmeyer flask.

[1] William Blum, "The Determination of Alumina as Oxide," Bur. Stand., *Sci. Paper*, No. 286.

The Erlenmeyer flask is supported at a convenient angle and hydrogen sulphide passed through until the platinum sulphide is all precipitated. Bring to boil and filter into another Erlenmeyer flask of the same size. Again pass hydrogen sulphide through the solution until the solution becomes cloudy owing to the presence of free sulphur. Complete reduction can be determined by testing a drop of the solution with potassium sulphocyanate.

The flask is now removed to the hot plate and supplied with a Bunsen valve. On boiling gently the solution will first become clear and finally all traces of hydrogen sulphide will be expelled. This point is ascertained by moistening a piece of filter paper with lead acetate solution and allowing the escaping steam to play upon it. When the filter paper fails to turn black, all hydrogen sulphide has been driven off.

The Bunsen valve is removed and the iron titrated with $N/25$ potassium permanganate. The permanganate is added slowly while the solution is given a rotary motion. The end-point is reached when a pink flash is obtained throughout the whole solution. Two drops excess will color the solution for several seconds.

Titanium

After the titration of iron the solution is transferred to a 250 cc. graduated flask. When cool, 5 to 10 cc. of hydrogen peroxide free from fluorine are added and the flask filled to the mark. Pipette 50 cc. of this solution into a Nessler tube.

Pipette 10 cc. of a standard titania solution containing approximately 0.001 gram per cc. into a 100-cc. graduated flask. Add 5 to 10 cc. of hydrogen peroxide and fill to the mark. After mixing add 10 cc. to a second Nessler tube and add water from a burette until the color matches that of the test solution. From the results calculate the percentage of TiO_2.

Large amounts of iron and alkali sulphates interfere with this determination. In this class of products, however, only a small amount of iron is found and there is sufficient sulphuric acid present to prevent interference by the alkali sulphate.

In comparing the colors it is best to use some form of colorimeter. Otherwise the shadows produced make the comparison difficult.

Alumina

By deducting the iron and the titania from the total alumina precipitate ($Al_2O_3 + Fe_2O_3 + TiO_2$) the percentage of alumina is found.

Calcium Oxide

The two filtrates from the alumina, iron and titania precipitations are combined and evaporated to about 400 cc. Bring the solution to boil

and add 25 cc. of saturated ammonium oxalate solution and a few cc. of ammonia. After continuing the boiling for one or two minutes longer, set the solution back on the hot plate so that it will remain hot but not boil. Evaporate in this way to a volume of approximately 250 cc. Remove from the hot plate and allow to stand over night. Filter, wash the precipitate of calcium oxalate two or three times. Save the filtrate. Redissolve the precipitate into the original beaker with dilute hydrochloric acid $(1-1)$.

Dilute the calcium solution to 250 cc. Heat to boiling, add a few cc. of the ammonium oxalate solution and precipitate with ammonia. Heat again to boiling and allow the precipitate to settle for two hours, keeping hot. At the end of this time, filter off the precipitate. Wash six times with hot water.

To the beaker used for the precipitation, add 150 cc. of water and 6 cc. of concentrated sulphuric acid. Heat to about 70°C and introduce the filter paper containing the precipitate of calcium oxalate. Titrate with $N/25$ potassium permanganate, allowing for the effect of the filter paper. Calculate the percentage of CaO.

Magnesia

Combine the filtrates from the calcium oxalate precipitations and evaporate to about 400 cc. Dissolve one gram of sodium-ammonium phosphate in a little warm water and add to the solution. Next add 100 cc. of ammonia, and allow to stand at least twelve hours.

At the end of this time filter off the precipitate, rejecting the filtrate. Redissolve the precipitate into the original beaker with dilute nitric acid $(1-5)$. Dilute to 150 cc. and again precipitate with 5 cc. of the sodium-ammonium phosphate solution and 50 cc. of ammonia. Allow the precipitate to stand four or five hours; filter, and wash well with cold water to which 5% ammonia has been added.

The precipitate can be collected either in a Gooch or on filter paper. Where filter paper is used it should be burnt off very slowly. The electric furnace is ideal for igniting magnesia.

Finally weigh the precipitate as $Mg_2P_2O_7$ and multiply the weight by 0.3621 to reduce it to MgO.

The addition of 50 cc. of alcohol will facilitate the precipitation of the magnesium-ammonium phosphate.

Potash and Soda

The alkalies are usually determined by the J. Lawrence Smith method. The description of this method given by Washington[1] may well be consulted where detail and great accuracy are desired.

[1] H. S. Washington, "The Chemical Analysis of Rocks," 191 (1919).

Pulverize about one gram of the sample in an agate mortar until it is reduced to an extremely fine powder. Weigh out 0.5000 gram and place in the clean agate mortar. To this add one-half gram of ammonium chloride and mix thoroughly with the aid of the pestle.

Approximately 4 grams of calcium carbonate are now weighed out and added to the mixture in two or three portions, care being taken to thoroughly mix the three ingredients. It is desirable that each particle of the sample be in contact with a particle of calcium carbonate, and a particle of ammonium chloride.

A small amount of calcium carbonate is now tamped into the bottom of a platinum crucible; the mixture is then added and covered with an additional portion of the carbonate. The crucible is covered and warmed gently for 15 minutes after which the heat is increased until only the lower half of the crucible is a dull red. Continue to heat in this way for 45 minutes. The heat is then removed and the crucible allowed to cool.

To a platinum or porcelain basin add 50 to 75 cc. of water and cover with a watch glass. When the fusion has cooled introduce the crucible and contents and also the cover. Allow to stand a short time and remove the crucible and cover. The melt is now broken up with the acid of the agate pestle and the liquid brought to boil. Decant into a 600-cc. beaker. Break up the residue, add 100 cc. more of water and bring to boil again. Decant as before. This operation is repeated the third time except that the contents of the basin are transferred entirely to the filter. The residue is then washed several times with hot water.

To the filtrate, which should have a volume of 300–400 cc., add 3 or 4 cc. of ammonia and bring to boil. In the meantime about 2 grams of ammonium carbonate are dissolved in cold water, and added until complete precipitation takes place. Keep hot and allow the precipitate of calcium carbonate to settle. Filter into two six-inch porcelain evaporating dishes and evaporate nearly to dryness. Transfer both solutions to a platinum basin or a three-inch evaporating dish and continue the evaporation to dryness.

The next operation is to expel the ammonium salts by gentle ignition with a moving flame. Finally bring the basin to dull redness to remove the last traces of salts, care being taken to avoid heating the alkalies above their melting points. Allow the basin to cool and add 25–30 cc. of water. Tip the basin to insure solution of the soluble salts and add two drops of ammonium oxalate. Evaporate again almost to dryness. Take up with 5–10 cc. of water and filter into a platinum crucible of 35-cc. capacity. Rinse the basin and wash six times with small amounts of hot water. Add two drops of dilute hydrochloric acid and evaporate the solution to dryness. Ignite gently to expel the ammonium salts, care being taken to avoid decrepitation and volatilization of the alkalies. When the crucible has cooled take up again in 5–10 cc. of warm water and again

filter. This time the filtrate is received in a weighed platinum crucible of 35 cc. capacity. Evaporate, ignite gently, and weigh as NaCl + KCl.

Separation of Potash[1]

The chlorides as obtained above are dissolved in the crucible with about 5 cc. of water and a definite amount of chloroplatinic acid added. If the solution of chloroplatinic acid contains 0.05 gram of platinum per cc., the result will be the number of cubic centimeters of chloroplatinic acid to be added. In order to be certain that an excess of the platinum solution has been used it is well to add a few drops excess. In this class of work 1 cc. will be sufficient in practically all cases.

The crucible is now placed on the water bath and allowed to simmer. If the precipitated potassium platini-chloride does not dissolve when the liquid is warm, a few cc. of water are added to effect its solution. Evaporate until the liquid becomes syrupy and solidifies on cooling. Allow the evaporation to cool and fill the crucible half full with alcohol of 0.86 specific gravity and allow to soak.

When all but the precipitated platini-chloride has gone into solution, the solution is decanted through a Gooch filter. Wash several times by decantation using the specified alcohol and finally transfer the precipitate to the filter. Continue the washing several times. Remove to an air bath at 130° to remove all traces of water. When this has been accomplished remove to a desiccator and when cool weigh as K_2PtCl_6.

Multiply the weight of potassium platini-chloride by 0.1938 to reduce to K_2O. Also multiply the weight of the platini-chloride by 0.307 to reduce it to KCl. This result deducted from the weight of the total chlorides gives the weight of the NaCl, which in turn is multiplied by 0.5308 to reduce it to Na_2O.

Summation of Results

There are on record, analyses which total 102 to 103%. These are obviously much too high and as a rule the error is not due to high results on all the constituents. It is more likely attributable to one determination and that determination is alumina.

Owing to the nature of the alumina precipitate, it is capable of adsorbing large amounts of fixed alkalies. Hence, great care must be exercised in washing it properly. Secondly impure ammonia, and failure to remove the platinum taken up during the fusion will add still more to this constituent.

An analyses which totals above 100% is usually better than one which totals below. There are always small amounts of impurities in the re-

[1] H. S. Washington, *op. cit.*, 202.

agents and considerable dust is collected before the analysis is finished. There are also minus errors which may occur but they are usually overbalanced by the plus ones. In the course of a great many analyses on products running from 60 to 85% Al_2O_3, it has been found that the summation of the constituents given will be between 100% and 100.50%. It should be emphasized, however, that these results can be obtained only by exercising the necessary precautions. Where there is a great amount of work to be done and where speed is an important consideration the allowable limit might be extended to 101%.

Solutions Required

Acids.—The concentrated acids used have specific gravities approximately as follows:

Hydrochloric Acid	1.20
Sulphuric Acid	1.84
Nitric Acid	1.42

Ammonium Carbonate.—Make up as needed by dissolving 1 to 2 grams in cold water.

Ammonium Hydroxide.—The concentrated ammonia water of 0.92 specific gravity is used. It should be free from carbonates and should not be kept in glass bottles. To purify, redistil over lime and store in ceresine bottles or in the regular five-pint acid bottles which have been coated inside with ceresine. If ammonium carbonate is the only impurity present, the ammonia water can be boiled to decompose the carbonate.

Ammonium Nitrate.—Neutralize 20 cc. of concentrated HNO_3 with ammonia until the solution is just alkaline to rosalic acid. Dilute to 1 liter.

Ammonium Oxalate.—It is best to recrystallize this after filtering to free from calcium oxalate. Dissolve 1 gram in 50 cc. of water when needed.

Chloroplatinic Acid.—Of that containing about 37 per cent platinum, 10 grams are dissolved in 50 cc. of cold water. Filter through a small filter into a reagent bottle and make up to 75 cc.

Hydrogen Peroxide.—Merck's "Superoxal" is used.

Potassium Permanganate.—Make up a normal solution by dissolving 31.6 grams in 1 liter of water. Dilute this to approximately 25th normal. Allow to stand at least one week and standardize with sodium oxalate prepared for such work by the U. S. Bureau of Standards.

Titanium Standard Solution.—Either potassium titanofluoride (K_2TiF_6) or titanium oxide (TiO_2) may be used. To prepare with K_2TiF_6, the salt is heated one hour at 150°C to drive off moisture. To 1.5 grams in a platinum crucible add 5 grams of sulphuric acid $(1-1)$. Evaporate until fumes of sulphur trioxide are given off strongly but do not take to

dryness. Repeat four or five times. When cool add 5 cc. of sulphuric acid and cautiously dilute with water. Add enough more sulphuric acid so that there will be at least 5 per cent of the final volume. Allow to cool and dilute to the mark in a 500-cc. graduated flask.

Mix the solution well and pipette off 50 cc. and dilute with water. Bring to boil and precipitate with ammonia water. Filter, wash well, ignite and weigh as TiO_2. Fuse the TiO_2 with potassium pyrosulphate, dissolve the melt, and determine the Fe_2O_3 present by potassium permanganate after reduction with hydrogen sulphide. Deduct this from the TiO_2.

The titania solution if made up as directed will contain approximately 0.001 gram TiO_2 per cc.

If TiO_2 is used instead of K_2TiF_6 0.5 gram is taken. It is either fused with potassium pyrosulphate or evaporated with a mixture of hydrofluoric and sulphuric $(1-1)$ acids. Finally evaporate with sulphuric acid $(1-1)$ several times and make up to 500 cc. as described above.

AMERICAN REFRACTORIES CO.
JOLIET, ILLINOIS

TESTING BARIUM CARBONATE FOR USE IN TERRA COTTA BODIES

BY W. L. HOWAT AND G. A. WILLIAMS

ABSTRACT

The value of barium carbonate for neutralizing soluble salts in a terra cotta body depends upon its activity when in contact with soluble salts. An activity test is given.

The value of barium carbonate for use in a terra cotta body to neutralize the soluble salts depends upon its activity when in contact with these soluble salts. Since the activity of a given sample of barium carbonate cannot be judged by its purity, or solubility in water or dilute hydrochloric acid, the following simple test has been adopted for this purpose.

Taking magnesium sulphate as a typical soluble salt the test is as follows:

Weigh out 2 grams of the barium carbonate sample and place in 100 cc. of a 10% solution of magnesium sulphate. Allow to stand 1 hour at 70°F (21°C) stirring at 10-minute intervals with a glass rod.

Filter and wash with warm water until no white precipitate shows when tested with barium chloride. Wash precipitate consisting of barium sulphate and barium carbonate which has remained unchanged into a beaker and treat with dilute hydrochloric acid. Collect the barium sulphate now remaining by filtering and washing with warm water until the filtrate is free of barium chloride as shown by testing with a drop of sulphuric acid.

Ignite and weigh. Correct this weight by subtracting the weight of the barium carbonate sample which is insoluble in dilute hydrochloric acid.

Convert weight of barium sulphate into terms of barium carbonate ($BaSO_4$: $BaCO_3$ = 233:197), then this weight divided by weight of sample of barium carbonate taken, times 100 equals per cent of barium carbonate which has reacted with the magnesium sulphate.

A modification of this test might also be used with equally satisfactory results, but since the per cent of barium carbonate reacting in such a test depends upon (1) the concentration of the soluble sulphate salt used, (2) the kind of soluble sulphate used, (3) the temperature, and (4) the time, it is obvious that for purposes of comparing different samples of barium carbonate over a period of time, the test must be carried out on a standard procedure.

Results to show the magnitude of the variation from these different causes are as follows, with a given sample of barium carbonate used for all tests:

Test no.		Per cent of barium carbonate reacting
1	Regular magnesium sulphate test as given	25.6%
2	Using double strength magnesium sulphate	42.5%
3	Using an equivalent amount of sodium sulphate (10.9 grams of $Na_2SO_4 7H_2O$ instead of 10 grams of $MgSO_4 7H_2O$)	73.5%
4	Using regular 10% solution of magnesium sulphate but standing for 1 hr. at 100°C instead of 21°C	78.3%
5	Regular test but standing 5 hrs. instead of 1 hr.	33.3%

It is evident from these results that in the body the longer the body is aged and the warmer the temperature, the more effective the barium carbonate will be in reacting with soluble sulphates in the body.

Effect of Fineness of Barium Carbonate

To determine whether the fineness of the barium carbonate had any effect on the per cent reacting with magnesium sulphate, the regular test was run on Sample A, as received, and after grinding 8 hrs. dried in a small jar mill. A sieving test was made before and after grinding. Regular magnesium sulphate test and sieving test was also made on a different lot of barium carbonate—Sample B.

Results	Sample "A" as received	Sample "A" ground 8 hrs.	Sample "B" as received
On 60-mesh	2.29%	0.10%	1.84%
On 100-mesh	1.16	0.62	0.60
On 120-mesh	1.86	2.51	0.26
On 150-mesh	1.39	1.55	0.79
On 200-mesh	1.83	2.92	0.90
Pan	91.47	92.30	95.61
Per cent reacting with magnesium sulphate	29.0 %	32.8 %	27.4 %

We concluded then, that while grinding a sample of barium carbonate finer would increase its activity, a sieving test comparison between two different samples would not show which was the more active. It is probable that the degree of fineness of the 90% or more through 200-mesh sieve which an ordinary sieving test will not classify has more effect on activity than the size of the 10% or less above 200-mesh.

The following are some typical figures obtained on various samples of barium carbonate

Sample no.	Insoluble in dilute HCl	Per cent reacting with $MgSO_4$
1	3.30%	31.5%
2	2.60	33.5
3	.0	31.8
4	.0	33.3
5	2.3	26.8
6	0.95	27.4
7	0.65	29.2
8	1.68	25.1
9	2.60	34.6
10	2.56	34.5
11	2.30	22.8
12	3.72	13.7
13	10.10	16.0
14	98.30	..

Below 25% reaction in the magnesium sulphate test makes the value of a sample of barium carbonate doubtful.

ATLANTIC TERRA COTTA CO.
PERTH AMBOY, N. J.

PROPOSED TENTATIVE FELDSPAR SPECIFICATIONS[1]

Since the last Annual Meeting, 1922, the Committee has been in correspondence with several producers and large consumers of feldspar.

The consumers are a unit as regards specifying the characteristics of the feldspar they purchase. As might be expected the producers see many difficulties in the way. However great and real these difficulties are, they must be surmounted to the end that the industries which give to feldspar its value may enjoy a greater measure of freedom from uncertainty and consequent loss.

Specifications for commercial feldspar and flint by A. W. Watts,[2] have assisted us all, as well as the thorough work published as Bulletin 53, of the Bureau of Mines 1913, on the "Mining and Treatment of Feldspar and Kaolin."

[1] The Discussion accompanying these specifications which took place at the White-ware Division Meeting, Pittsburgh, will appear in an early issue of the *Bulletin.*

[2] *Jour. Amer. Ceram. Soc.,* **3** [9], 722 (1920).

It has become the practice of certain manufacturers to use more than one kind of feldspar and ground to various degrees of fineness. Feldspar millers are now grinding finer than was the common practice of even two years ago. In this connection a series of valuable suggestions have been received from Mr. G. E. Sladek calling attention to the fact that at the present time feldspars in use are of definitely different composition and definitely different grinding characteristics.

Specifications for Commercial Feldspar for Use in the Manufacture of Whiteware

In view of the above it is suggested that Prof. Watts' specifications be amended as follows:

1. The Sample.—In sampling car-load lots, equal amounts should be taken from at least five different points in the car, no two samples being taken within five feet of each other. In sampling from a bin, five separate samples shall be taken from different portions of the bin and not more than two from the same level. The total sample shall not be less than ten pounds.

The samples shall be thoroughly mixed on a smooth surface, divided in halves, one-half spread evenly over the other half. Repeat this operation five times. The mixed sample shall then be quartered and two quarters not adjoining rejected. The remaining quarters shall be mixed as described above, five times, quartered as before and two quarters rejected. The remaining sample shall weigh more than 2.2 pounds (1 kilo.) and shall be placed in a tight receptacle, marked with an identifying number or with the name of the material, car or bin number and data on which the sample was taken.

Chemical Composition

Grade	$K_2O\%$	$Na_2O\%$	$CaO.MgO\%$
	above	below	not above
A	10	3.6	0.75
B	9	3.2	1.00
C	7.8	2.8	1.00
	not above	not below	
D	3.0	7.0	1.00

Physical Properties and Tests

1. Color and Specking.—Bearing in mind the variety of wares in which feldspar is used and the various standards as to color and specking, potters find it necessary to establish; it is considered desirable to leave this matter open to agreement between vendor and vendee.

2a. Fineness of Grain.—One hundred grams of the sample, after being dried to constant weight at 105°C, shall be tested for fineness of grain according to the process set forth in paragraph 2b and the residues on the various sieves shall not exceed the maxima as set forth in the following table:

Screen no.	100	140	200	270	325	Total residue
Grade 1	0.25	0.5	1.25	2.0	5.0	9%
Grade 2	0.50	1.0	2.5	4.0	6.0	14%
Grade 3	0.75	1.25	3.75	5.0	8.0	18.75%

For the screen analysis the Standard Screen Scale sieves are used the openings increasing in the ratio of the fourth root of 2 or 1.189 as recommended in *Year Book*.[1] All percentages are made on the dry basis.

2b. Method of Making the Fineness Test.—The 100 grams of dry sample shall be transferred to the sieve and over a sieve pan which fits closely enough to prevent loss by slopping. The pan shall contain sufficient water to reach within not less than $^3/_4$ inch (20 mm.) or more than $1^1/_4$ inch (31 mm.) from the pan. The sieve and pan shall be vibrated or shaken in such a manner that water in the pan is splashed on the screen from below so as to wash the powder about and cause the material that can pass through the sieve to pass into the pan below. This treatment shall be continued until no more material can be removed.

The residue and sides of the sieve shall then be thoroughly washed with water by means of a laboratory wash bottle.

2c. The Washing Process.—In the washing process a fine brush may be used to break down such small aggregates as refuse to break up by washing alone.

The order of the sieves shall be as follows: Wash the sample on the 325-mesh sieve to remove all fines, as this facilitates an accurate classification of the coarse material. The material passing this sieve may be concentrated by evaporation to dryness and weighed, or may be immediately thrown away and its amount determined by difference. The residue on the 325-mesh sieve is transferred to the 100-mesh and washed as described above. The material on the sieve is dried and weighed; the material passing the 100-mesh sieve is transferred to the 140-mesh sieve and washed and this process continued to the 200, 270 and 375 in order, the residues on each being dried and weighed.

Note: In the water ground feldspar some lumps persistently refuse to break up. I have found it very difficult to completely wash the material without some aid of this sort and have experienced no objectionable results from a soft brush.

3. Moisture Content.—Unless otherwise specified the purchase price shall be based on moisture free material and the moisture content shall be determined as follows: 50 grams of the sample (paragraph 1) are carefully weighed out as soon as possible after sampling, and placed in an oven where a temperature between 105°C and 110°C is maintained with proper ventilation till the sample ceases to lose weight, the loss in weight shall be calculated to per cent of the dry weight and so reported.

In case a suitable chemical balance is available the moisture test may be determined on a 5 gram sample.

4. Fusion Behavior.—Test cones of the feldspar shall be made of standard dimensions, *i. e.*, 2 $^7/_8$ inches high (75 mm.) by $^9/_{16}$ inch (15 mm.) across the base of one face. The use of an organic bond, such as dextrine or gum arabic, is permissible to ensure cones retaining form prior to fusion, but such added material must burn out completely and not affect the color of the fired material. The fusion behavior of the different feldspars shall be as follows for the grade 2 grind.

Grade A Feldspar shall fuse with or before Orton cone 9
Grade B Feldspar shall fuse with or before Orton cone 8
Grade C Feldspar shall fuse between Orton cones 7 and 8
Grade D Feldspar shall fuse with or before Orton cone 7

5. Shipping.—All material purchased under these specifications shall be shipped in clean closed cars.

6. Rejection.—The purchaser reserves the right to reject material which does not conform to the above specifications in every particular and to return rejected material to the vendor for full credit at price charged f.o.b. point of delivery specified by the purchaser.

[1] *Year Book*, AMER. CERAM. SOC., p. 36 (1922–23).

PROPOSED TENTATIVE SPECIFICATIONS COVERING THE PURCHASE OF PULVERIZED FLINT

To Be Used in the Manufacture of Whiteware

1. Sample.—Same as paragraph 1, Feldspar Specifications.[1]

2. Chemical Composition.—The material shall conform to the following limits of chemical composition.

Silica, not less than	99.60%
Potash and Soda, not more than	.15%
Iron Oxides, not more than	.05%
Lime	.10%
Magnesia, not more than	.10%
Alumina, not more than	.10%

Physical Properties and Tests

3a. Color.—The flint when formed into a standard cone and fired in a closed sagger or muffle to a temperature of cone 8 shall have a pure white color both on the surface and the interior and shall be easily broken by the fingers, indicating no fusion.

3b. Fineness of Grain.—One hundred grams of the sample after being dried to constant weight at 105°C shall be tested for fineness of grain by the process set forth in paragraph 2b, Feldspar Specifications, and the residues on the various standard sieves shall not exceed the maximum totals as set forth in the following table.

	Standard Sieve Number					
Grade	100	140	200	270	325	Total residue
1	0.10%	0.2%	1.50	2.00	5	8.8%
2	0.50%	1.0%	2.50	3.50	6.5	14.0

All percentages are calculated on the dry basis.

3c. Moisture Content.—Unless otherwise specified the purchase price shall be based on the moisture free material and the moisture shall be determined as described under paragraph 3, Feldspar Specifications.[2]

3d. Fusion Behavior.—Test cones shall be made of the material according to standard dimensions, *i. e.*, 2 $^7/_8$ inches (75 mm.) by $^9/_{16}$ inch (15 mm.) across the base of one face. An organic bond as dextrine or gum arabic is permissible to insure the cones retaining their form prior to fusion, but such added material must burn out completely and not affect the color of the material. The flint when made into cones as described above shall not deform before cone 24.

3e. Shipping Conditions.—All material purchased under these specifications shall be shipped in clean closed cars.

4. Rejection.—The purchaser reserves the right to reject material which does not conform to the above specifications in every particular and to return rejected material to the vendor for full credit at price charged f.o.b. point of delivery specified by the purchaser.

[1] See p. 163, *This Bulletin.*

[2] *Ibid.*

DISCUSSION ON "SPECIFICATIONS ON FLINT"

H. SPURRIER:—A slight change has been made from the specifications made by Prof. Watts in that the rejections cover the whole shipment rather than a part. It seems an injustice to the shipper to reject part of his shipment and force him to handle the rest at less-than-carload-rates.

F. S. HUNT:—I think that there should be several grades of fineness, and that some grades of flint should not require such fineness of grain.

H. SPURRIER:—That is why two were specified. One is allowed .1% and the other is allowed .5% on 100-mesh. Grade 1 would allow .2% on 140-mesh, and grade 2 would allow 1% on 140-mesh; 200-mesh would be 1.50% for No. 1 and 2.50% for No. 2; 270-mesh would be 2.00% for No. 1 and 3.5% for No. 2; 325-mesh would be 5.0% for No. 1 and 6.5% for No. 2; with a total residue on grade 1 of 8.8% and on grade 2, 14.0%. This composition comes well within the range of published analyses. Some firms offer 99% to 99.9% silica. One company in particular that sells large quantities of flint runs 99.7% and a little over SiO_2 and to put that requirement at 99.5% seems to be well within industrial limits. This protects the consumer from carelessness.

B. E. SALISBURY:—Have any of the flint producers checked this and commented on it?

H. SPURRIER:—No one has seen it since these are only proposed specifications.

B. E. SALISBURY:—I suppose that it is the idea of the Committee to work in collaboration with the raw materials producers. We can set up standards satisfactory to us but they will not mean anything without the consent of the producers. We must have the backing of the raw materials producers or we can make no progress.

H. SPURRIER:—I have a published analysis of a firm producing flint and inasmuch as they have published it and presented it to prospective purchasers it becomes a specification. This producer states that his flint contains 99.8% SiO_2; alumina, .17%; oxide of iron, .104%; lime, 0; magnesia, 0. He offers you 99.8% SiO_2. Others too, offer that high.

F. K. PENCE:—The alumina seems a little low here in the specifications.

H. SPURRIER:—I have other analyses here. Another one shows 99.75% SiO_2; .06% Al_2O_3; commercial flint. This is taken from my private card index which I have kept for a number of years and I have more than one hundred analyses. They are samples offered to the industry and accepted as working material by the producers.

F. K. PENCE:—Alumina is not particularly harmful only as it cuts down the silica content. Much good quality flint will run higher than 11% alumina. In the case of the analysis read by Mr. Spurrier, I know that the concern in question puts out a high grade flint, yet they have an anal-

ysis showing .17% of alumina. This is not serious for it only reduces the SiO_2, but it is not as bad as if it had that much lime or iron. I think that the maximum on alumina might well be raised.

C. C. Treischel:—It might be well to explain the manner in which we intend to proceed with these specifications. They have been referred back to the Division by the divisional Committee on Standards. This Division must recommend to the Standards Committee of the Society as a whole either the adoption of such a specification or its adoption in a tentative way with certain reservations. We must, however, take action of some sort.

Eric Turner:—From the grinders' standpoint, I do not believe that there is anything in particular to live up to. From the producer's standpoint we do not know. We have taken a grade of sand that certain consumers have required.

F. K. Pence:—We have given two grades on the grinding. We might have another set of specifications on analysis as well.

H. Spurrier:—I think that it would be entirely proper that we increase the alumina. There is an automatic check there. The presence of Al_2O_3 would imply other things. The SiO_2 would be reduced so as not to come within the specifications. I think the Al_2O_3 should be raised but 99.5% does not seem too exacting.

B. E. Salisbury:—Would it be feasible to specify the minimum silica content? We might establish limits of impurities, the total of which shall not exceed the difference between the minimum and 100%.

Eric Turner:—The specifications for flint seem to be entirely feasible from the producers point of view with one exception. The standard set for the fineness of grain is rather higher than that of the general run of flint marketed to the whiteware trade. In my short experience the average grind of several producers has run a little over 1% (one) residue on a standard 140 test screen. It is not hard to produce flint ground to .2% residue on the above screen but the finer the grind the higher the miller's power bill and therefore the consumer should be expected to pay such a price as would compensate the miller for increased costs.

F. S. Hunt:—I think that it would be well to specify the silica in harmful ingredients but omit the alumina entirely. The silica would take care of that.

H. Spurrier:—That is similar to the action taken on specifications for other materials. For instance, iron analyses and brass impurities are specified. In similar specifications, in iron or steel, phosphorus is specified. Flint is one thing that we can specify very closely. And I do not think it out of order to keep close watch on the other materials.

F. K. Pence:—You intend to put them in before alumina?

H. Spurrier:—Yes.

B. E. SALISBURY:—Mr. Pence, is it the idea to leave the other elements specified. Of those I think that it is highly important to have a limit on the iron oxide at least.

F. K. PENCE:—Iron oxide, .05. What do you think of adopting the other items and leaving the alumina out of it?

H. SPURRIER:—If that means retaining the 99.6%, I am agreed to it.

A motion was made by Mr. Hunt, seconded by Mr. Spurrier and adopted that the proposed specifications for flint stand as given except that under "Chemical Composition" no mention be made of the alumina content.

A motion was then made by Mr. Treischel, seconded by Mr. Salisbury and adopted that the specific action for flint, as amended be adopted by the White Wares Division and recommended to the Standards Committee for action according to the method prescribed by the rules of the SOCIETY.

R. B. LADOO:[1]—The composition of flint as given in the specifications automatically rules out all hydrous or opalescent silicas such as tripoli, diatomaceous earth, true flint, chalcedony, chert, etc., because these materials all contain more or less combined water and do not usually run as high as 99.6% SiO_2. The iron content should be governed by the color of burned test specimens and not by absolute percentage. In other words the method of taking care of the iron content in flint should be the same as that used in the feldspar specifications.

I believe that under composition should be stated only the maximum permissible amounts of harmful impurities such as lime and magnesia, leaving out impurities which are only diluents such as alumina, potash and soda.

I have in mind a hydrous silica tested by a plant ceramist of unquestionable ability and good judgment. This silica had a rather high content of chemically combined water, over 1% alumina and only about 90% silica; yet it was found to be of high grade and perfectly well adapted for the manufacture of the best grades of whiteware.

I do not believe that the flint specifications should be so rigidly drawn as to exclude high grade silica very low in harmful impurities, but which contains much less than 99% SiO_2 due to a high content of combined water and to small amounts of alumina, potash and soda. While it is true that flint is bought for its content of SiO_2 a slightly lower silica content in a hydrous silica might easily be compensated for by a lower price. Aside from harmful impurities such as iron, lime and magnesia the physical properties of the flint should govern and not the chemical properties.

Under paragraph 2, of the Flint Specifications, should be noted the more rapid and efficient method of making sieve tests as described in my discussion, paragraph 2b, in the Feldspar Specifications.

[1] Recd. April 27, 1923.

RECOMMENDED SPECIFICATIONS[1] FOR LIMESTONE, QUICKLIME AND HYDRATED LIME

For Use in the Manufacture of Glass

ABSTRACT

A general description of the use of lime in glass manufacture is followed by definitions of the terms "limestone," "quicklime," and "hydrated lime," and a statement as to the commercial packages in which these materials are marketed.

The quality of lime used in glass manufacture may vary. Any lime containing more than 83 per cent of the oxides of calcium and magnesium is suitable for glass manufacture, provided only that certain particularly deleterious substances are within reasonable limits. The composition should not vary from day to day more than 2 per cent. The material should all pass a No. 16 sieve.

Complete directions for sampling, testing, and retesting are included.

General

1. Use of Lime in Making Glass.—Most common glasses are fused mixtures of alkali (usually soda), alkaline earth (usually lime), and silica. Freedom from color is important in determining the quality of glass, which, in turn, depends upon the absence of coloring oxides (usually iron) from the raw material.

Limestone, quicklime, or hydrated lime may be used for making glass. The decision as to which to use is generally based on availability, cost, and present practice.

2. Definition of Limestone, Quicklime, and Hydrated Lime.—Limestone consists essentially of calcium carbonate, or of calcium and magnesium carbonates where the amount of the latter does not exceed 45.5 per cent. Quicklime is the product resulting from the calcination of limestone and consists essentially of calcium oxide, or of calcium and magnesium oxides. It will slake when water is added to it, and this slaking is accompanied by an evolution of heat and an increase in volume. Hydrated lime is a dry powder which is made by treating quicklime with enough water to satisfy its chemical affinity under the conditions of manufacture. It consists essentially of calcium hydroxide, or of a mixture of calcium hydroxide and magnesium oxide or hydroxide.

3. Packing.—Limestone is shipped in bulk in carload lots, or in cloth or paper bags. Quicklime is shipped either in bulk in carload lots or barrels holding 180 pounds net or 280 pounds net each. Hydrated lime is shipped in paper bags holding 50 pounds net each.

Requirements

1. Quality.—Except for the constituents enumerated below, the composition of a limestone, lime, or hydrated lime may vary within wide limits and still be satisfactory to the glass manufacturer. Either high calcium or high magnesium material may be used. It is essential, however, that the composition be reasonably uniform from day to day. Otherwise the difficulty of controlling the process of manufacture would become too great.

2. Composition.—Quicklime shall not contain more than 3 per cent CO_2 as shipped. Hydrated lime shall not contain more than 5 per cent CO_2 as shipped, and shall contain sufficient water to meet the chemical requirements of the calcium oxide.

Limestones, quicklimes, and hydrated limes may be divided into three classes,

[1] Issued by Department of Commerce, Bureau of Standards, *Circ.* **118,** Dec. 8, 1921.

depending upon the character of glass for which they are suitable. To meet these specifications, the constituents listed below shall not exceed the maximum percentages nor fall below the minimum percentages given in the following table:

TABLE I

COMPOSITION OF THE NON-VOLATILE PORTION OF LIMESTONE, QUICKLIME OR HYDRATED LIME

Ingredients	Class 1 Maximum	Class 1 Minimum	Class 2 Maximum	Class 2 Minimum	Class 3 Maximum	Class 3 Minimum
$CaO + MgO$	...	96	...	91	....	83
Fe_2O_3	0.2	..	0.4	..	0.8	..
$SO_2 + P_5O$						
(*a*) In Limestone	1.0	..	1.0	..	1.0	..
(*b*) In Quicklime or Hydrated Lime	3.0	..	3.0	..	3.0	..
SiO_2	4.0	..	9.0	..	17.0	..
Al_2O_3	3.0	..	5.0	..	5.0	..

The sum of the calcium and magnesium oxide is specified in the above table. In order to prevent undue variation in the relative proportions of these two ingredients the per cent calcium oxide shall be established by contract, and it is specified that the per cent calcium oxide shall not vary more than 2 per cent either way from the contract figure.

An approximate figure for the content of alumina should also be included in the contract. This figure must come within the limits set in the above table, and it is specified that the amount of alumina in the material delivered shall not vary more than 1 per cent either way from the contract figure.

3. Fineness.—Unless otherwise specified, limestone, quicklime, and hydrated lime shall be crushed so that all will pass a No. 16 sieve.

NOTE.—A No. 16 sieve has an opening of 1.19 mm. and a wire diameter of 0.54 mm., with a permissible tolerance of 2 per cent in the opening and 10 per cent in the wire diameter.

4. Marking.—Each carload of material, or fraction thereof, shall be legibly marked with the names of the consignor and consignee, and with some means of identifying the particular contract on which the shipment is made.

This information is in addition to that required by the Federal lime-barrel law.

5. Retesting.—Notice of the rejection of a shipment based on these specifications must be in the hands of the consignor within 10 days after the receipt of the shipment at the point of destination. If the consignor desires a retest, he shall notify the consignee within 5 days of receipt of the notice of rejection. The consignee shall provide all reasonable facilities to permit the consignor to resample the material. This retest shall be at the expense of the consignor.

Sampling and Testing

1. Sampling.—The purchaser will bear all expense of sampling and testing. When limestone or quicklime is shipped in bulk, the sample shall be so taken that it will represent an average of all parts of the shipment from top to bottom, and shall not contain a disproportionate share of the top and bottom layers, which are most subject to changes. The sample shall consist of 1 shovelful for each 3 tons of material, but not less than 10 shovelfuls, taken from different parts of the shipment. The total sample taken shall weigh at least 100 pounds, shall be mixed thoroughly, and "quartered" to provide

a 15-pound sample for the laboratory. In case a shipment consists of more than one car, a separate sample shall be taken from each car.

When quicklime is shipped in barrels, at least 3 per cent of the number of barrels shall be sampled. They shall be taken from various parts of the shipment, dumped, mixed, and sampled as specified in the above paragraph.

In the case of hydrated lime, the sample shall be a fair average of the shipment. Three per cent of the packages shall be sampled. The sample shall be taken from the surface to the center of the package. The material so obtained shall be thoroughly mixed and quartered to provide a 2-pound sample for the laboratory.

When sampling quicklime or hydrated lime, it is essential that the operation be conducted as expeditiously as possible, in order to avoid undue exposure of the material to the air. The sample to be sent to the laboratory shall immediately be placed in an air-tight container in which the unused portion shall be stored until the shipment has been finally accepted or rejected by the purchaser.

The sample may be taken either at the point of shipment or at the point of destination, as agreed upon by the contracting parties. If it is desired to enforce the requirement as to carbon dioxide, the sample must be taken at the point of shipment.

2. **Testing.**—The following directions are a brief summary of the analytical methods which are recommended. For more complete information on this subject references should be made to "The Analysis of Silicate and Carbonate Rocks," by W. F. Hillebrand, United States Geological Survey, Bulletin No. 700.

Blast 0.5 g. of the sample for 15 minutes in a platinum crucible. Cool and transfer to an evaporating dish. Mix to a slurry with distilled water. Add 5 to 10 cc. concentrated HCl. Heat gently until solution is complete, breaking up lumps if necessary. Evaporate to dryness on water bath. Add 5 to 10 cc. concentrated HCl and dilute with an equal volume of distilled water. Digest on water bath for 10 minutes. Filter and wash with hot water. Evaporate the filtrate to dryness. Dissolve in acid and water as before. Filter, and wash with hot water. Ignite the two precipitates together and weigh as silica and insoluble matter.

Dilute the above filtrate to 250 cc. Add HCl if necessary to insure a total volume of 10 to 15 cc. Make alkaline with NH_4OH. Boil until odor of NH_3 is barely noticeable. Filter, and wash slightly with hot water. Dissolve the precipitate with hot dilute HCl and repeat the precipitation as before. Filter and wash thoroughly with hot water. Ignite and weigh as oxides of iron, aluminum, and phosphorus.

To the filtrates from the above add a few drops of NH_4OH and bring to a boil. Add 25 cc. of a saturated solution of $(NH_4)_2C_2O_4$. Continue boiling until the precipitate becomes granular. Let stand until precipitate settles clear. Filter, and wash with boiling water. Ignite the precipitate, dissolve in dilute HCl, and dilute to 100 cc. Add excess of NH_4OH, and boil. Filter out any insoluble matter, ignite and weigh, and add its weight to the oxides of iron and aluminum found previously. To this filtrate add $(NH_4)_2C_2O_4$, proceeding as before. Filter, and wash with boiling water. Ignite, and blast to constant weight as calcium oxide.

Acidify the filtrates from the above with HCl. Evaporate to 150 cc. Add 10 cc. of a saturated solution of $NaNH_4HPO_4$ and boil. Cool. Add NH_4OH drop by drop, with constant stirring, until the precipitate starts to form. Then add moderate excess of NH_4OH. Stir for several minutes. Let stand over night. Filter, and dissolve the precipitate in hot dilute HCl. Dilute to 100 cc., add 1 cc. of saturated solution of $NaNH_4HPO_4$, and precipitate as before. Filter, and wash with an alkaline solution made by diluting NH_4OH until it contains about 2.5 per cent NH_3 and then add a few drops of HNO_3. Ignite, and weigh as $Mg_2P_2O_7$. Multiply this weight by 0.3621 to find the weight of MgO.

Place 5 g. of the sample of quicklime or hydrated lime, or 0.5 g. of limestone, in a small Erlenmeyer flask and cover with hot distilled water. Connect this flask into a carbon-dioxide train, set up as follows: Next to the flask is a reflux condenser, to which is connected a calcium-chloride drying tube, followed by a tube containing anhydrous $CuSO_4$, then another tube of $CaCl_2$, then by two tubes filled with soda lime, and finally by another tube of $CaCl_2$. The entire train must be so arranged that a stream of CO_2 free air can be kept passing through it. Start this stream of air. Weigh the tubes containing soda lime and replace them in the train. Add to the sample in the flask about 25 cc. of 1:1 HCl, being careful that no gas is lost and that the effervescence is not too violent during the operation. When the effervescence diminishes, heat the flask, bringing the liquid gradually to boiling. Boil for 10 minutes. Remove the flame and allow the flask to cool while the stream of air is still flowing, for 15 minutes. Disconnect and weigh the soda-lime tubes. Their increase in weight is recorded as carbon dioxide.

Dissolve 5 g. of the sample in HCl and evaporate to dryness. Dissolve the residue in HCl, filter, and wash with hot water. Fuse the residue with Na_2CO_3. Treat the filtrate with NaOH in boiling solution, filter, and wash with hot water. Dissolve both this precipitate and the fused residue in dilute H_2SO_4. Reduce with Zn and titrate with $\frac{N}{20}$ $KMnO_4$. Calculate the result to per cent Fe_2O_3.

Dissolve 2 g. of the sample in 10 cc. water and 15 cc. 1:1 HCl. Filter out insoluble matter. Dilute filtrate to 250 cc. Heat to boiling and add 10 cc. of a boiling 10 per cent solution of $BaCl_2$, drop by drop, with constant stirring. Let stand over night, filter, wash with hot water, ignite, and weigh as $BaSO_4$. Calculate to per cent SO_3.

Dissolve 10 g. of the sample in 80 cc. of 1:1 HNO_3. Filter, wash, fuse the residue with Na_2CO_3, dissolve the melt in HNO_3, and add this solution to the filtrate. Boil the filtrate with 10 cc. of 1.5 per cent $KMnO_4$ solution until MnO_2 is precipitated. Add enough H_2SO_3 to dissolve the MnO_2. Neutralize with NH_4OH. Add 1 cc. of concentrated HNO_3 for every 100 cc. of solution. Bring to 40°C and precipitate with ammonium molybdate. Shake for 10 minutes and let stand at 40°C for 12 hours. Filter and wash with 1 per cent KNO_3. Dissolve the precipitate in a known volume of $\frac{N}{10}$ NaOH and CO_2 free water. Titrate the excess NaOH, *using phenolphthalein as indicator.* Calculate the per cent P_2O_5, using the proportion, P: NaOH = 1:23.

SUGGESTED SPECIFICATIONS FOR CERAMIC WHITING[1]

A. General

1. Definition of Ceramic Whiting.—Ceramic whiting is a finely ground white powder composed of nearly pure calcium carbonate or calcium carbonate and magnesium carbonate obtained from pulverizing and sizing chalk, marble or limestone, or as a chemically precipitated product.

2. Use of Whiting in Ceramic Products.—Whiting is used to furnish the calcium oxide component of glazes, enamels, and fluxed ceramic bodies. It is an active fluxing agent, rarely used in large quantities in body mixtures. It may be either used as a raw ingredient in glazes, or fritted or smelted with other glaze materials before application.

[1] Revised April 7, 1923.

3. **Packing.**—Whiting is packed and shipped in barrels holding not more than 325 pounds or bags holding not more than 125 pounds. The package should be labeled stating whether the contents is a natural rock whiting or a chemically precipitated whiting.

B. Requirements

1. **Quality.**—Whiting shall be uniform in quality (from shipment to shipment), both as to fineness of grain and composition. The calcium, magnesium, or total carbonates shall not vary more than $\pm 1\%$ and the silica not more than $\pm ^1/_2$ of 1% of a figure set by contract within the limits of the composition shown in Class 1 or Class 2. It should be manufactured from the purest rock available and should be free from particles of pyrites, iron-bearing silicates, metallic iron and gypsum.

2. **Composition.**—Whitings shall be divided into two classes, No. 1 being practically a pure calcium carbonate and No. 2 containing calcium carbonate with a considerable percentage of magnesium carbonate within the limits of the composition given. This does not indicate that one class is inferior in quality to the other, but indicates that numerous users prefer the magnesium whiting to the pure calcium whiting.

CLASS 1

Material	Total carbonates	$CaCO_3$	$MgCO_3$	Fe_2O_3	SiO_2	SO_3
Maximum..........	..	..	1%	0.25%	2.0%	0.1%
Minimum..........	97%	96%	...	....	...	...

CLASS 2

Material	Total carbonates	$CaCO_3$	$MgCO_3$	Fe_2O_3	SiO_2	SO_3
Maximum..........	..	..	8%	0.25%	2.0%	0.1%
Minimum..........	97%	89%	..	....	...	...

3. **Fineness.**—Screening samples by washing for ten minutes with stream of water practically without pressure shall not leave a residue of more than 1% on a No. 140 screen (or more than 2% on a No. 200 screen), and at least 98% of the material shall pass a No. 200 screen. It shall also be so fine that a separation made by a Pearson[1] air separator will show at least 85% of the material finer than .02 mm. and at least 48% finer than .01 mm.

As an alternative to the Pearson air separator method the following (not so desirable) may be used: $2^1/_2$ gms. of the material shall be shaken for ten minutes in a 250 cc. cylindrical graduate with 250 cc. of distilled water. On allowing to settle it shall require not less than 20 minutes for visible settling to cease when the cylinder is viewed in reflected light, using clear north sky light for illumination.

4. **Marking.**—Each shipment of material shall be legibly marked with the names of consignor and consignee and with some means of identifying the particular contract on which the shipment is made.

5. **Retesting.**—Notice of the rejection of a shipment based on these specifications must be in the hands of the consignor within 10 days after the receipt of the shipment at the point of destination. If the consignor desires a retest, he shall notify the consignee within five (5) days of receipt of said notice.

[1] The Pearson air separator developed at the Bureau of Standards by J. C. Pearson and F. A. Hitchcock gives excellent separations of fine dry powders and is the only machine which can be used for this purpose for particles as small as .01 mm. Its use is therefore recommended for manufacturers and users of fine powder such as whiting, flint, feldspar, paint pigments, etc.

C. Sampling and Testing

1. Twenty-five per cent of the number of packages shall be selected for sampling.—A core representing the contents of each of these packages shall be taken with a sampling tube. The total material so collected shall weigh not less than 5 lbs. This shall be thoroughly mixed and quartered to provide a $^1/_2$-lb. sample for the laboratory.

2. Testing.—The following directions are a brief summary of the analytical methods which are recommended. For more complete information on this subject references should be made to "The Analysis of Silicate and Carbonate Rocks," by W. F. Hillebrand, United States Geological Survey, Bulletin No. 700.

Blast 0.5 g. of the sample for 15 minutes in a platinum crucible. Cool and transfer to an evaporating dish. Mix to a slurry with distilled water. Add 5 to 10 cc. concentrated HCl. Heat gently until solution is complete, breaking up lumps if necessary. Evaporate to dryness on water bath. Add 15 cc. concentrated HCl and dilute with an equal volume of distilled water. Digest on water bath for 10 minutes. Filter and wash with hot water. Evaporate the filtrate to dryness. Dissolve in acid and water as before. Filter and wash with hot water. Ignite the two precipitates together and weigh as silica and insoluble matter.

Dilute the above filtrate to 250 cc. Make alkaline with NH_4OH. Boil until odor of NH_3 is barely noticeable. Filter and wash slightly with hot water. Dissolve the precipitate with hot dilute HCl and repeat the precipitation as before. Filter and wash thoroughly with hot water. Ignite and weigh as oxides of iron, aluminum and phosphorus.

To the filtrates from the above add a few drops of NH_4OH and bring to a boil. Add 25 cc. of a saturated solution of $(NH_4)_2C_2O_4$. Continue boiling until the precipitate becomes granular. Let stand one hour. Filter and wash with hot water. Ignite the precipitate, dissolve in dilute HCl, and dilute to 100 cc. Add excess of NH_4OH and boil. Filter out any insoluble matter, ignite and weigh and add its weight to the oxides of iron and aluminum found previously. To this filtrate add $(NH_4)_2C_2O_4$, proceeding as before. Filter, and wash with boiling water. Ignite, and blast to constant weight as calcium oxide.

Acidify the filtrates from the above with HCl. Add 10 cc. of a saturated solution of $NaNH_4HPO_4$ and evaporate to 150 cc. Cool. Add NH_4OH drop by drop with constant stirring until the precipitate starts to form. Then add moderate excess of NH_4OH. Stir for several minutes. Let stand over night. Filter and dissolve the precipitate in hot dilute HCl.

Dilute to 100 cc., add 1 cc. of saturated solution of $NaNH_4HPO_4$ and precipitate as before. Filter and wash with dilute NH_4OH (25% NH_3 containing a few drops of HNO_3). Ignite and weigh as Mg_2P_2O. Multiply this weight by 0.3621 to find the weight of MgO.

Place 0.5 g. of the sample in a small Erlenmeyer flask and cover with hot distilled water. Connect this flask into a carbon-dioxide train, set up as follows: Next to the flask is a reflux condenser, to which is connected a calcium-chloride drying tube followed by a tube containing anhydrous $CuSO_4$, then another tube of $CaCl_2$, then by two tubes filled with soda lime, and finally by another tube of $CaCl_2$. The entire train must be so arranged that a stream of CO_2 free air can be kept passing through it. Start this stream of air. Weigh the tubes containing soda lime and replace them in the train. Add to the sample in the flask about 25 cc. of 1:1 HCl, being careful that no gas is lost and that the effervescence is not too violent during the operation. When the effervescence diminishes, heat the flask, bringing the liquid gradually to boiling. Boil for 10 minutes. Remove the flame and allow the flask to cool while the stream of air is still

flowing, for 15 minutes. Disconnect and weigh the soda lime tubes. Their increase in weight is recorded as carbon dioxide.

To five grams of the sample in a covered vessel, add 25 cc. of water, and then cautiously 10 cc. of concentrated hydrochloric acid. Break up any lumps with the flattened end of a glass rod and boil for 2 or 3 minutes. (1) Reduce the hot solution with a few drops of stannous chloride solution, cool, dilute to 100 cc., add 10 cc. of mercuric chloride solution, and titrate with standard potassium dichromate solution ($N/20$), using potassium ferricyanide as outside indicator. Calculate the results to Fe_2O_3. A blank determination is desirable for comparison.

The permanganate method for determination of total iron, as given by Blair in "The Chemical Analysis of Iron," may also be used.

Fuse 2.5 g. of the sample with about 10 g. of sodium carbonate, and dissolve the melt in 10% hydrochloric acid. (Any insoluble residue should be filtered off and tested by flame test for barium. If barium is absent, the residue may be rejected; if present, the residue should be again fused with an excess of sodium carbonate, and the water extract tested for SO_3.) Dilute the clear solution to 250 cc. heat to boiling and add slowly 10 cc. of hot 10% solution of barium chloride. Formation of a white precipitate indicates the presence of sulfur. A blank test should be made to insure the purity of reagents used.

(1) For extremely accurate work any insoluble matter may be filtered off at this point, ignited, fused with sodium carbonate, and the melt dissolved in 10% hydrochloric acid and added to the filtrate.

DISCUSSION ON "SPECIFICATIONS ON WHITING"

LED BY H. H. SORTWELL

SECRETARY C. C. TREISCHEL:—The departments at Washington are very much interested in this specification but they want to get the final action from the AMERICAN CERAMIC SOCIETY before proceeding further with it.

H. H. SORTWELL:—Last year Mr. Williams, of the Bureau of Standards, made a study of a good many different brands of whiting which were on the market. Samples were collected from different users and from the results of those tests they wrote these specifications. The definition of whiting is:

> Whiting is a finely ground white powder composed of nearly pure calcium carbonate obtained from pulverizing and screening chalk, marble or limestone, or as a chemically precipitated product.

That gives a wide range in the source of materials which may be used. The general requirements are:

1. **Quality:** Whiting shall be uniform in quality (from shipment to shipment), both as to fineness of grain and composition. The carbonates shall not vary more than —1% and the silica not more than —$^1/_2$ of 1% of a figure set by the contract within the limits of the composition shown under (*b*). It should be manufactured from the purest material available and should be free from pyrites, iron-bearing silicates, metallic iron, and gypsum.

2. **Composition.**—Whiting shall have the following limitations in composition:

Material	Total Carbonates	CaCO	$MgCO_3$	Fe_2O_3	SiO_2
Maximum	......	...	2%	0.2%	4.0%
Minimum	95%	95%	...	...	...

B. E. Salisbury:—What do the analyses of the commercial firms show as to $CaCO_3$?

Chairman F. K. Pence:—I have a criticism of that specification. Here are some analyses: English cliffstone whiting SiO_2 out of analyses of four representative samples gave the silicate content slightly less than 1%. Another sample gave slightly in excess, 1.6%. I believe that 4% silica is too high. On domestic whitings analyses of four different samples from four different sources show silica contents of 1.28, 1.1, 1.03 and another one of 3.7%. Two per cent seems plenty high enough since even the last 3.7% is too high.

B. E. Salisbury:—Does that agree with the calcium content?

F. K. Pence:—No, there is another on that. I think that the magnesia is too low. English cliffstone will show 1.1% but domestic runs as high as from 5 to 7%. Many of these domestic whitings are perfectly good for industrial use. Hence I would criticize this specification on these two points.

H. Spurrier:—I agree in regard to the silica content. I have a number of analyses here. The first one is: Water, 0.16, carbon dioxide, 42.72; iron oxide and alumina, 0.61; lime, 53.44 (pure whiting would be 56%); silica, 2.09; magnesia, 0.08%. The magnesia is exceptionally low. Domestic materials run higher than that. However, in glaze making I think the magnesia content of 5% would be rather disturbing because of its important function. It usually increases the fluidity of the glaze in small amounts but its presence in larger amount decreases the fluidity. We ought to keep our magnesia reasonably low, but we might tolerate more than 0.08%. It should be about 2% maximum, as carbonate.

B. E. Salisbury:—That would bar a number of producers of whiting. At the same time it would save much trouble.

H. Spurrier:—That is what I have in mind. There are two things to consider: the buying and selling factors. Our own industry is the one that gives importance to these things and in regard to disturbing factors, the potters have enough to cope with. It is very difficult to operate a plant and get something constant if laboratory equipment is lacking. There is an urgent need for specifications or rather classification. Most of these things start out of the natural line, and you can't do very much. The process of manufacture doesn't improve from the point of view of composition. The final condition is improved, but since decisions have to be made more rapidly than the analyses, we ought to be able to place some

reliance on the goods. In the past we have had very little of that kind of assurance.

B. E. SALISBURY:—It seems to have been brought out that there are some kinds of work for which the domestic whiting is satisfactory. Could this not be handled like flint, by having two grades of whiting?

E. TURNER:—This method would be satisfactory if the gradation was not more than a certain amount. The magnesia should not vary more than one-half of one per cent from what they figure.

F. K. PENCE:—These specifications have provided for that. There seems to be a general consensus of opinion that 4% is too high for the silica content. I believe that 2% has been mentioned as the proper amount. Does anyone want to make a motion amending that portion of the specification?

B. E. SALISBURY:—I make that motion.

H. SPURRIER:—I second it.

C. E. JACKSON:—The Bureau of Standards never prepares any specifications that have not been drawn up with the full consent and advice of the producers. That specification has already come from the producers.

H. SPURRIER:—Some of these analyses show what the producers offer.

F. K. PENCE:—In chemical analyses there is seldom more than 2% of silica in either domestic or English whitings. That is too much in my opinion.

H. SPURRIER:—In one dozen analyses I have found but one whiting showing 3%. In my card index, covering a good many years there is only one showing 3%. Analyses which run higher do so from other reasons.

H. H. SORTWELL:—Might it not be a good idea to have two separate silica classifications?

P. H. BATES:—Then you are up against classifications and not specifications.

H. SPURRIER:—That probably is the final conclusion. You can classify, but not specify. Nature has done that for you.

F. K. PENCE:—As indicated by analyses from many different sources, it does not appear that 2% is unreasonable for silica content. We are ready to vote on the motions that we set the silica at not more than 2%.

The motion was put and carried that the silica content requirement of the specifications for whiting be set at not more than 2%.

F. K. PENCE:—It is questioned as to whether 2% is not too low a limit to place on the magnesia content. It is satisfactory for English cliffstone whiting but it would eliminate domestic whitings.

B. E. SALISBURY:—For purposes of discussion I move that we establish two classifications on whiting, Number 1 and Number 2.

F. K. PENCE:—May we have suggestions as to the limit?

C. E. JACKSON:—Magnesia, 5%.

F. S. HUNT:—Eight per cent.

F. K. PENCE:—I have 5.11, 7.23, 6.27, 6.21, 6.22.

A. V. BLEININGER:—These might be raised. If amounts of 5 or 6% do not do any harm I should be in favor of raising the magnesia content. I think that the limit of 5 to 6% would be satisfactory.

F. K. PENCE:—Most of the analyses on the domestics run over that amount.

A. V. BLEININGER:—Some of them run below that, but to be definite we might say 6% for magnesium carbonate.

H. SPURRIER:—The following analysis was made of waste material from the Solvay Process Company of Detroit. The silica was 1.62, magnesia (MgO), 4.77. This was made from the limestone of the Sibley Quarry near Detroit, which is partly dolomitic; $MgCO_3$, 9%; SO_3, .05%, that is, the sulphuric acid was originally sulphate. The lime ran 50 as CaO.

F. S. HUNT:—I do not believe that you can set a second classification at 6% unless you make a third at 8%.

F. K. PENCE:—It seems to me that you would have to include them in No. 2. No. 1 is going to eliminate them. It seems to me that you might as well let them in as to get within a per cent of it and cut them out.

C. E. JACKSON:—No. 2 gives a good range, but it will fill only a certain field. If we include all of the American whitings in No. 2, it would be their privilege to have a high magnesium.

It was moved by Mr. Jackson, seconded by Mr. Salisbury and adopted that the specifications for whiting be amended to include two classes, one with a magnesium content of 6% and the other with a magnesium content of 8%.

F. K. PENCE:—The iron content is all right, I believe. The analyses on English cliffstones show: .27, .263, .19, .196; domestic: .182, .204, .219; .2 seems quite close.

H. H. SORTWELL:—I think these figures were set from the results of analyses which were made from those samples examined at the Bureau of Standards. If .2 is considered too low, it might be all right to raise it to .25. That would match very well with the analyses already given.

F. K. PENCE:—I find there is some discrepancy in the iron content in whiting for this reason: In analyzing whiting it is dissolved in acid and the iron determination is made on solution. What remains is insoluble residue. If the two are put together it frequently runs over .2%.

H. SPURRIER:—A great many analyses are made where the iron oxide and alumina are together. For pottery purposes it is essential that the Fe_2O_3 is known. Very few manufacturers want to wait for analyses.

F. K. Pence:—That is true. Mr. Mueller, what figure do you usually get out of the insoluble residue?

H. C. Mueller:—For Fe_2O_3, I believe .3 of 1% could be used.

F. K. Pence:—Do you recall whether you get .05 or .1 on the iron in the insoluble residue?

H. C. Mueller:—One-tenth.

B. E. Salisbury:—It is quite evident if the analyses you have on the best grade of whiting procurable run from .2 of 1% that it would be unwise to run over that on specifications.

F. K. Pence:—I think that it is too close. In ground cliffstone rock there is more than .2 iron. There is no way of washing the iron from limestone rocks laid down by nature. Twenty-five hundredths is more reasonable and some are more than that.

H. C. Mueller:—I know of one which was reported by the company which gave an Fe_2O_3 content of .14 of a per cent and English whiting usually runs .22 or .23. This was reported as .14.

F. K. Pence:—It actually was as high as .22. We thought the difference was from the insoluble residue.

It was moved by Mr. Salisbury, seconded by Mr. Jackson and adopted that the iron content of whiting in the specifications be set at not more than .25%.

H. H. Sortwell:—The proposed specification for fineness is as follows:

Fineness: Screening samples by washing for ten minutes with a stream of water practically without pressure shall not leave a residue of more than 1% on a No. 140 screen (or more than 2% on a No. 200 screen) and at least 98% of the material shall pass a No. 200 screen. It shall also be so fine that a Pearson air separator will show at least 85% of the material finer than .02 mm. and at least 48% finer than .01 mm.

In comparing these whitings there was a difference in grain fineness that would not be shown in sieves up to 200-mesh. The rest of the specification simply describes the details of sampling and testing the material. If these limits for fineness are satisfactory the points are all covered.

B. E. Salisbury:—I should like to see a requirement that the producer shall put on his invoice and his container whether or not the whiting is precipitated.

This motion was approved by common consent.

G. Simcoe:—I should like to suggest the point that the sulphur present indicates the presence of gypsum and this causes a great deal of trouble. The carbonates go off at a lower temperature when bodies are open and the gas escapes. The sulphates go off at a higher temperature when bodies are viscous producing pimples.

H. H. SORTWELL:—The specification states that if there were any considerable amount of sulphur the material would be rejected.

F. K. PENCE:—The point which covers that is under number $2a$ which says "It should be manufactured from the purest materials available and should be free from iron-bearing silicates, pyrites, metallic iron and gypsum. On the other hand we specify the iron content.

I. E. SPROAT:—Under $2b$ it also says: "The qualitative test described below shall indicate the absence of sulphur."

F. K. PENCE:—According to this, there should be no sulphur at all.

G. SIMCOE:—But it should be guaranteed.

B. E. SALISBURY:—That could be put under the impurities.

H. SPURRIER:—I have no actual data on this, but I have never found any sulphur. The qualitative test finds a heavy trace of some. But this point is very important.

F. K. PENCE:—I suppose this can be referred to the Committee and let them find out what it ought to be. Does anybody have any suggestion as to what limit should be stated in chemical analysis for sulphur?

C. E. JACKSON:—Preferably zero.

The use of whiting or Paris white for Ceramic purposes has been handed down to American potters largely by the English. The source of English whiting is the chalk cliffs of England. The whiting or Paris white made from these cliffs is remarkably pure and possesses physical properties peculiar to itself.

The uniformity of its chemical composition makes it the standard material and any whiting or Paris white should be compared with this material and classified accordingly. I suggest a specification defining the ideal chemical composition then placing a limitation on the permissible variation of any whiting or Paris white not coming within the limits being classed as a No. 2 whiting or Paris white.

Furthermore, the term whiting should not be used in Ceramic Literature unless whiting is desired. Whiting is made from the soft weathered English Cliffstone rock, while Paris white is made from the hard unweathered rock and is considered by English potters the better material for pottery purposes. Samples of the crude rock weathered and unweathered show quite a different physical structure. The unweathered rock would seem to be more uniform.

I. E. SPROAT:—I think whiting containing sulphur ought to be rejected.

F. K. PENCE:—I think the best way is to put this up to the Committee on Standards so that we can have something more than a general statement. There is some sulphur present but if we are running into a slug of gypsum we ought to be able to determine in these specifications a way to exclude it. By common consent we will incorporate into our instructions a definite limit on sulphur.

It was moved by Mr. Salisbury, seconded by Mr. Jackson and adopted that the specifications for whiting, as amended, be adopted by the White Wares Division and recommended to the Standards Committee for action according to the method prescribed by the rules of the SOCIETY.

A. E. WILLIAMS:—The Interdepartmental Conference Committee on Chemical Lime greatly appreciated the discussion of the whiting specifications, and the additional information and checking of figures against factory experience should make these specifications satisfactory and useful.

In accordance with the discussion, the specifications have been changed so that the maximum silica content is now only 2%, the allowable iron content 0.25%, and a figure for sulphur is provided allowing 0.1%.

The situation with regard to magnesium is slightly uncertain in that the motion adopted as recorded by the stenographer provides for two classes of whiting, one containing 6% and another 8% MgO. But judging from the context of the discussion, we are assuming that there are two classes intended, one a high calcium whiting allowing 2% of MgO, and another a dolomitic whiting allowing 8% MgO as a maximum. These maximums, together with the tolerances placed on the contents of CaO and MgO from shipment to shipment from any one dealer should provide a uniform raw material.

The revised specifications are attached herewith and further discussion is encouraged.

PROPOSED TENTATIVE SPECIFICATIONS FOR SILICA SAND FOR GLASS-MAKING

The specifications for limestone, burnt lime and hydrated lime presented to the Division last year have been handed to the Standards Committee of the SOCIETY to obtain approval of the SOCIETY. This specification has been slightly modified, allowing 3.0% of SO_3 and P_2O_5 in burnt and hydrated limes, this being because of the use of fuels containing sulphur in burning the stone.

The following is the tentative specification for glass sands submitted by the Committee for discussion. These specifications have been prepared by Committee on Standards of the Glass Section in coöperation with the Bureau of Standards.

General

(1) **Character of Sand.**—Sand as commonly used for glass-making purposes is a white, clean, dry, fine-grained quartz, washed practically free from all clay-like material and other impurities. The chief criterion for a good glass sand is that it should be practically all silica and contain very little iron.

In view of the increasing use of alumina in a glass batch and of the varying amounts of iron allowable in green or amber glass, sand of lower grade may be used by many manufacturers. These specifications, therefore, will show a variety of qualities and state more or less definitely the types of glass they may be used for. The quality number is not to be interpreted as necessarily being an index to value of the product.

Requirements

2. **Packing.**—Cars in which sand is to be shipped shall be thoroughly cleaned before loading, and lined with paper where sand is sold for first, second or third quality.

3. **Impurities.**—Sand shall not be contaminated with stripping dirt or contain any crushed stones or pebbles. These impurities are often insoluble in the melting glass, producing stones.

4. **Screening and Washing.**—All sand shall be screened, washed and dried before shipment, except where the natural condition of the quarries will allow the production by screening only of fourth, fifth, sixth or seventh quality sand.

TABLE I

PERCENTAGE COMPOSITION OF SANDS OF VARIOUS QUALITIES (BASED ON IGNITED SAMPLES)

Qualities	SiO_2 Max. Min.	Al_2O_3 Max. Min.	Fe_2O_3 Max. Min.	CaO + MgO Max. Min.
First quality optical glass	99.8	0.1	.02	0.1
Second quality flint glass containers tableware	98.5	0.5	.035	0.2
Third quality flint glass	95.0	4.0	.035	0.5
Fourth quality sheet glass rolled and polished plate	98.5	0.5	.06	0.5
Fifth quality sheet glass rolled and polished plate	95.0	4.0	.06	0.5
Sixth quality green glass containers and window glass	98.0	0.5	0.3	0.5
Seventh quality green glass	95.0	4.0	0.3	0.5
Eighth quality amber glass containers	98.0	0.5	1.0	0.5
Ninth quality amber	95.0	4.0	1.0	0.5

5. Although sand may vary considerably in composition, depending on the type of glass to be made, the composition of any single quality specified shall not vary from shipment to shipment more than the amounts stated in Table II.

TABLE II

PERCENTAGE TOLERANCES IN COMPOSITION ALLOWED (BASED ON IGNITED SAMPLE)

Quality	SiO_2	Al_2O_3	Fe_2O_3	CaO + MgO	Rmx
1	±0.1%	±.05%	+0.005%	±0.05%	
2	±0.5	±0.1	+0.005	±0.05	
3	±1.0	±0.5	+0.005	±0.1	
4	±0.5	±0.1	+0.005	±0.1	
5	±1.0	±0.5	+0.005	±0.1	
6	±1.0	±0.5	±0.05	±0.1	
7	±1.0	±0.5	±0.05	±0.1	
8	±1.0	±0.5	±0.1	±0.1	
9	±1.0	±0.5	±0.1	±0.1	

6. Sand shall be prepared so that the size of grains shall be rather uniform and be within the limits set in Table III:

TABLE III

LIMITING PER CENTS OF VARIOUS SIZES OF SAND GRAINS

Through a No. 20 screen	100%
Through a No. 20 and remaining on a No. 40 screen	Not more than 60% nor less than 40%
Through a No. 40 and remaining on a No. 60 screen	Not more than 40% nor less than 30%
Through a No. 60 and remaining on a No. 100 screen	Not more than 20% nor less than 10%
Through a No. 100 screen	Not more than 5%

Methods of Testing

Screen tests shall be made with sand dried to 110°C, using United States Bureau of Standards standard screen sizes.

Methods of Analysis

To determine silica, lime and alumina, follow methods given in Hillebrand's Rock Analysis, U. S. G. S., Bulletin No. 700.

Iron may be determined by any of the following methods:

Colorimetric Method of Iron with Sulphocyanate.

Scott's Standard Methods of Chemical Analyses (*Bull.* **3**(1907)), page 222.

Electrometric Titration.

Stokes & Cain Method (Bureau of Standards).

The following method may be used for solution of the sands for any method of determining iron:

.5 gm. sample. Fuse in Pt crucible with four times wt. of pure Na_2CO_3. Dissolve in 200 cc. warm H_2O (warm on steam bath). Dilute 15 cc. of conc. HCl to 50 cc. Add this from a burette slowly, drop by drop to the solution, stirring frequently and keeping solution cold to prevent silica from separating out. The acid having been added, add a small amount of pure Zn (.05 gm.) to solution to precipitate out any Pt dissolved in the carbonate fusion. When Zn has dissolved, filter the solution into a 500-cc. graduated flask and proceed.

ACTIVITIES OF THE SOCIETY

WE ARE GROWING EVERY DAY IN EVERY WAY BIGGER, BETTER AND MORE EFFECTIVE IN SERVICE TO CERAMIC INDUSTRIES

The score board for the 1923 membership committee is as follows in net totals at each of the dates of record.

	Personal	Corporation	Total	Net gain by months
January 12	1571	213	1784	
March 14	1710	223	1933	149 (2 months)
April 14	1738	226	1964	31
May 14	1775	233	2008	44
Total net gain	204	20	224	

The record of the individual score getters during the fiscal month of April 15th–May 14th is as follows.

	Personal	Corporation
R. K. Hursh		1
Howard Frost		1
Charles W. Crane		1
Frederick H. Rhead	2	
R. R. Shively	2	
A. S. Watts	2	
D. F. Albery	1	
E. E. Ayars	1	
L. E. Barringer	1	
Arthur B. De Vol	1	
J. F. Greene	1	
Frank M. Hartford	1	
Seiji Kondo	1	

	Personal	Corporation
A. Malinovszky	1	
C. W. Parmelee	1	
Robert C. Rahn	1	
Herman Reinbold	1	
Louis E. Rodgers	1	
S. Satoh	1	
J. B. Shaw	1	
Alexander Silverman	1	
Gaylord T. Stowe	1	
E. W. Tillotson	1	
W. W. Wilkins	1	
W. G. Whitford	1	
Office	12	4

Total 37 Personal
7 Corporation

The passing of the 2000 membership mark is noteworthy—but only in the passing. Two thousand members never was the goal, in fact the possible roster of ceramists whose industrial welfare is served by the SOCIETY is many times two thousand. When passing the 2000 membership mark the SOCIETY is merely starting on its way.

NEW MEMBERS RECEIVED FROM APRIL 15 TO MAY 14

PERSONAL

Agazim, Michael, 365 E. Illinois St., Chicago, Ill., Salesman, Wishnick-Tumpeer Chemical Co.

Booth, William K., 737 Addison St., Chicago, Ill., The Booth Electric Furnace Co., Secy. and Chief Engineer.

Brooks, John W., Avery and Whittier Aves., Syracuse, N. Y., Secy.-Treas., Pass and Seymour, Inc., Solvay, N. Y.

Carlstrum, C. G., 503 Perry Payne Bldg., Cleveland, Ohio, Manager, Refractory Products Company.

Cahoon, Chester P., 42 S. Main St., Salt Lake City, Utah.

Denison, Geo. W., 8829 Broadway, Cleveland, Ohio, Vice-Pres. and Gen. Manager, The Ohio Clay Company.

Drever, Horace, 908 Chestnut St., Philadelphia, Pa., Electrical Engineer, Manufacturing-Electric Furnace Construction Co.

Du Bois, Hassell Burton, Alfred, N. Y., Student, Alfred University.

Facer, Charles A., 1242 Oak Grove Ave., Steubenville, Ohio, Decorator and Designer, H. Northwood and Co.

Fick, Clarence W., General Electric Company, Schenectady, N. Y., Engineer in Power and Mining Department.

Galvin, Grover H., Rockford, Ia., Vice-Pres. and Gen. Mgr., Rockford Brick and Tile Co.

Gosser, George W., 438 S. 4th St., Coshocton, Ohio, Ass't Supt., Pope-Gosser China Co.

Grady, George Morrill, 74 Pacemont Rd., Columbus, Ohio, Student, O. S. U., Columbus.

Fuwa, Kitsuzo, 589 Araijiku Iriarai-Machi, Ebara-Gun Tokyo-Fu, Japan, Engineer, Tokyo Electric Co.

Hilgenberg, Carl G., % Carr Lowrey Glass Co., Fairmont, W. Va., President.

Hill, W. H., Murphysboro, Ill., President, Murphysboro Paving Brick Co.

Hoduker, W., Dipl. Ingenieur, Tlmenan, Thüringen, Germany.

Jackson, Will F., Olivet, Mich., Bird Artist.

Koyama, I., Technical College at Keijo, Korea, Japan.

Krause, Ellis L., 218 Fifth St., Marietta, Ohio, Prof. of Chemistry, Marietta College.

Lewis, J. H., Van Briggle Tile and Pottery Co., Colorado Springs, Colo., Secy. and Treas.

Marvel, P. A., Croze Bldg., Philadelphia, Pa., The Vitrifax Co.

Morton, William A., 1317 Fulton Bldg., Pittsburgh, Pa., President, Amsler-Morton Co., Inc.

Prowell, Harry D., 726 S. Hope St., Los Angeles, Cal., Pyrometer Engineer, Adolf Frese Corpn.

Pumphrey, M. E., 40 Rector St., N. Y. City, Salesman, General Refractories Co.

Rafter, Michael Joseph, 728 Plum St., Vineland, N. J., Manager, Kimble Glass Co.

Reinbold, Herman, 103 S. 18th St., Omaha, Neb., Pres., Reinbold Metallurgical Co.

Riddick, James W., Jr., 4702 Lexington St., Chicago, Ill., Methods Engineer, Western Electric Co., Hawthorn Sta.

Senn, William E., 808 W. Adams St., Sandusky, Ohio, Student, O. S. U.

Sondles, Merrill A., 421 S. 7th St., Coshocton, Ohio, Statistical Engineer, Pope-Gosser China Co.

Smith, Geo. O., Carr Lowrey Glass Co., Baltimore, Md., Chemist and Glassmaker.

Starr, C. D., 116 Point St., Providence, R. 1., Supt., Rehoboth Porcelain Enamel Co.

Stein, Chas. M., 48 rue de la Boëtic, Paris, France, Fuel Engineer.

Trostel, Louis J., 103 Buell Ave., Joliet, Ill., Chief Chemist, American Refractories Co.

Wells, J. M., Newell, W. Va., Treas., American Potteries Co.

Yamuzawa, Itsuo, Nihon Chitsuso Hilyō Co., Minamatama-chi, Ashikitagumi, Kumamoto Ken, Japan.

Zimmer, W. H., Waldershof, Bavaria, Johann Haviland Porzellanfabirk.

CORPORATION

Armstrong Cork and Insulation Co., Pittsburgh, Pa., N. B. Gates, Pres.

Crossman Company, South Amboy, N. J., Charles W. Crane, Pres.

Illinois-Pacific Glass Co., Fifteenth and Folsom Sts., San Francisco, Cal., Otto Rosenstein, Vice-Pres.

Jointless Fire Brick Co., 1130 Clay St., Chicago, Illinois, Albert Goetz, Treas.

Olean Tile Company, Olean, N. Y., Gordon Phillips.

Pacific Clay Products Co., Los Angeles, Cal., E. M. Durant, Pres.

Weir Stove Co., Taunton, Mass., J. L. Anthony, Pres.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

A. E. Acheson has changed his address to 19 Kensington Ave., Jersey City, N. J.

Walter O. Amsler, formerly president of the Amsler-Morton Co., of Pittsburgh is now with the Owens Bottle Factory–1, 982 Wall St., Toledo, Ohio.

E. E. Ayars is living at 702 Jasper St., Joliet, Ill.

M. C. Booze of Mellon Institute has moved to Thackery and O'Hara Sts., Pittsburgh.

R. C. Brett has notified the Secretary's office that his address is 1697 Lee Road, Cleveland Road, Cleveland Heights, Ohio.

James E. Brinckerhoff, formerly of East Liverpool, Ohio, with the Babcock and Wilcox Co., has removed to 95 Liberty St., N. Y. City with the same company.

M. L. Bryan is now with the Columbia Terra Cotta Co., Box 788, Vancouver, Wash.

Dorothy Peck Chapman who has been living at East Orange, N. J., has moved to 23 Carolina Road, Montclair, N. J.

E. V. Coulston has left the Rock Island Stove Co., at Rock Island, Ill., and is living at 1265 E. 55th St., Cleveland, Ohio.

S. F. Cox has moved from Haverhill St., to 1011 Coal St., Wilkinsburgh, Pa.

T. W. Garve is now living at Brazil, Ind., 106 E. Compton St.

Marsden H. Hunt of the Western Electric Co., has moved from San Francisco to 62nd and Green Sts., Emeryville, Cal.

G. G. Kent formerly of the Detroit-Star Grinding Co., is now with the Square D Co., Peru, Ind.

H. J. Knollman of Philadelphia recently accepted a position with the Pacific Clay Products Co., at Los Angeles, Cal.

Chas. E. Kraus has changed his address to 110 W. 40th St., New York City.

R. B. Ladoo has resigned from the Bureau of Mines, Washington, D. C. and has an office with the newly formed Southern Minerals Corporation at 901 Continental Bldg., 14th and H Sts., N. W., Washington, D. C.

Percival Marson of Edinburgh, Scotland is now technical superintendant and chemist with Messrs. Sowerby's Ellison Glass Works, Ltd., Gateshead-on-Tyne, England.

G. Z. Minton is living at 1221 S. Anderson St., Elwood, Ind.

D. M. Moodie has removed from Norwood, N. Car., to 1225 Hamlet St., Columbus, Ohio.

Joseph K. Moore formerly of 120 Broadway, N. Y. City is now at 11 Broadway.

The Pacific Clay Products Company is located at 600 American Bank Bldg., 129 W. Second St., Los Angeles, Cal.

F. K. Pence has moved from East Liverpool, Ohio to Paducah, Ky., where he is located with the Paducah Tile and Pottery Co., as President.

Amos Potts is with the Franklin Brick and Tile Co., 8 East Long St., Columbus, Ohio.

Walter S. Primley, president of the Wisconsin Granite Co., has moved his office in Chicago, Ill. from W. Washington St., to 105 West Monroe St.

Louis E. Rodgers of the L. E. Rodgers Engineering Co., formerly of Chicago has moved to the Central Life Bldg., Ottawa, Ill.

John E. Sachs is living at 1221½ Main St., Evansville, Ind.

H. H. Sortwell who has been with the Bureau of Standards at Washington, D. C. is now with the Star Porcelain Co., Trenton, N. J.

Harry Spurrier has left the Square D. Co., at Peru, Ind., to accept a position with the Northwestern Terra Cotta Co., Chicago, Ill.

A. H. Stewart, formerly of Mellon Institute is now with the Phoenix Glass Co., at Monaca, Pa.

C. A. Underwood has changed his address to the General Refractories Co., 40 Rector St., New York City.

Jack H. Waggoner has moved from Topeka, Kans., to Charleston, W. Va., where he is located with the Libbey-Owens Sheet Glass Co.

Thomas C. Walker, Jr., is working for the Central of Georgia Railway at the Ceramic Experiment Station, Columbus, Ohio. Mr. Walker was formerly with the Matewan Tile Co., Matewan, N. J.

S. Paul Ward recently of the Shasta Zinc and Copper Co., Winthrop, Cal. is now with the Nevada Consolidated Copper Co., McGill, Nevada.

Word has been received that **Pittsburgh High Voltage Insulator Co.**, of Derry, Pa. has been changed to the **Westinghouse High Voltage Insulating Company.**

ELEVATION TO ACTIVE MEMBERSHIP

The Board of Trustees has acted favorably on the promotion from Associate to Active membership. These were nominated by the active members of the SOCIETY.

ASSOCIATES NOMINATED TO ACTIVE MEMBERSHIP

Edward Anderson, Supt., The A. A. Simonds Co., Dayton, Ohio
Cecil E. Bales, Louisville Fire Brick Wks., Highland Park, Ky.
Ralph F. Brenner, H. C. Fry Glass Co., Rochester, Pa.
Alfred E. Blake, 928 Union Arcade, Pittsburgh, Pa.
A. Lee Bennett, U. S. Bur. of Mines, Seattle, Washington
Lawrence H. Brown, Edwin M. Knowles Co., Newell, W. Va.
Dr. E. N. Bunting, 203 Ceramics Bldg., U. of I., Urbana, Ill.
John Clark, 292 Lockwood St., Astoria, N. Y., N. Y. Architectural Terra Cotta Co.
B. F. Drakenfeld, Jr., Treas., Drakenfeld Co., So. Murray St., New York
Frederic W. Donahoe, Secy., Refractory Mfgrs. Assoc., 840 Oliver Bldg., Pittsburgh, Pa.
Walter Geer, Jr., N. Y. Architectural Terra Cotta Co., 401 Vernon Ave., Long Island City, N. Y.
T. D. Hartshorn, U. S. Bur. of Standards, Kensington, Md.
James O. Handy, Pittsburgh Testing Lab., Box 1115, Pittsburgh, Pa.
H. S. Hower, Carnegie Institute of Tech., Pittsburgh, Pa.
R. F. Harrington, 388 Dorchester Ave., S. Boston, Mass., Hunt-Spiller Mfg. Corp.
R. F. Ferguson, Mellon Institute, Pittsburgh, Pa.
Herbert I. Insley, U. S. Bur. of Standards, Washington, D. C.
Paul S. MacMichael, Northern Clay Co., Auburn, Wash.
W. J. Rees, Lecturer and Head of Research Dept. in Refractories, Univ. of Sheffield, Ranmoor, Sheffield, England
Dr. S. R. Scholes, Federal Glass Co., Columbus, Ohio
Geo. E. Sladek, Beaver-Falls Art Tile Co., Beaver Falls, Pa.
L. E. Saunders, Mgr. Research & Abrasive Plants, Norton Co., Worcester, Mass.
J. M. Stangl, Factory Mgr. Fulper Pottery Co., Flemington, N. J.
Gus M. Tucker, N. Y. Architectural Terra Cotta Co., 401 Vernon Ave., Long Island City, N. Y.
C. A. Underwood, Amer. Refractories Co., 120 Broadway, N. Y. City.
Dr. R. R. Shively, Chief Technologist, B. F. Drakenfeld & Co., New York

AMENDMENTS TO CONSTITUTION

All the amendments to the Constitution and By-Laws as published in advance in April *Bulletin*, page 86, received the necessary affirmative votes hence they are now operative.

For the nomination of Trustee Representatives of the Divisions it shall be necessary for each member who wishes to vote to declare which of the Divisions shall be known as his Major Division. A member can vote on Trustee representative only in that Division which he shall declare to be his Major. This declaration of Major Division membership will not affect one's membership in any of the other Divisions nor his vote on any question other than nomination of Trustee Representatives except as shall be described in the rules adopted by the Divisions themselves.

CONVENTIONS OF THE SOCIETY

Summer Meeting.—Details of the summer meeting in August have not been worked down to a definite program but this much is known. The Detroit Section with Frank H. Riddle leading is planning to give a royal welcome and a profitable time to those of the SOCIETY who will be their guests, August 8, 9, 10 and 11.

Glass and enamel products, spark plugs, grinding wheels, wall tile brick, indeed a large variety of ceramic plants and a large number of other industrial plants such as the automobile factories will be visited.

Most pleasant lake and river excursions are planned.

A more profitable week and excursion could not be planned than with fellow ceramists in the Detroit district.

The profit and pleasure is as much from the fellowship and broadened acquaintances as from the plants visited.

The 1924 Annual Convention.—Atlantic City, February 4, 5, 6, is the place and time.

The New Jersey Clay Workers' Association and Eastern Section of the AMERICAN CERAMIC SOCIETY of which Andrew Foltz is president, will be the hosts.

Hotel Traymore will be the headquarters.

Plans are already in the making for unusual plant trips on Thursday, Friday and Saturday of the Convention week.

CONTRIBUTION TO NEW CERAMIC SCHOOL

Mr. A. F. Greaves-Walker, President of the AMERICAN CERAMIC SOCIETY, has secured an important donation of equipment for the new school of Ceramics at the Georgia School of Technology, Atlanta, Ga. The contribution from the J. C. STEEL AND SONS Co., was secured by personal solicitation by Mr. Greaves-Walker and consists of one of their No. 3 Combined Brick and Tile Machines (20–30 M capacity) and a Hand Cutter for both brick and tile. The SOCIETY wishes to express its appreciation to this firm for their part in the organization of this new school of ceramic engineering.

OBITUARY

John J. Herold, late superintendent of the Ohio Pottery Company, died at his home in Zanesville on Wednesday, April 18. He had been in poor health for a number of years, and had not been active in business for several months.

Herold was born in 1871 in Carlsbad, Austria. He received his primary education locally and attended various art schools. He went through the usual period of apprenticeship and became a decorator on china and glass. As he was not in sympathy with the military domination of that time, he came to this country about twenty-eight years ago.

He worked in various glass factories in the East and came to Zanesville where he worked in the local art potteries, later becoming superintendent of the Roseville Pottery, a position which he held until 1908 when he went to Golden, Colorado on account of his health.

He built a small pottery, experimented with local clays and raw materials and developed and produced chemical porcelain ware, a product which is in considerable use in this country, but which before 1914 came from Germany, then the principal source of supply.

The Herold China Company was organized, and this company now operating as the Coors Porcelain Company practically enjoys the monopoly of the chemical porcelain industry in this country at the present time.

Herold was essentially a potter and not a business man. Consequently he was throughout his career more or less a victim of those who preferred to take advantage of his lack of business experience rather than capitalize on the full possibilities of his practical knowledge and at the same time give him a fair acknowledgment in return.

He left the Golden concern which he founded and organized and came to Cambridge, Ohio, where he produced chemical porcelain wares for the Guernsey Earthenware Company, and later was one of the founders and the superintendent of the Ohio Pottery Company where chemical porcelain, cooking wares and later porcelain dinner wares were produced.

Herold's work in Colorado was remarkable for the fact that he explored the mountains of the district for clays and raw materials, afterwards using these in his products. His first equipment was very primitive, and operated with little or no assistance except that of his brother-in-law who was not a potter.

He had little means, consequently his difficulties will be appreciated by those who know the conditions involved, especially when it is remembered that he was in poor health and not expected to live for a considerable period.

Besides his work on high temperature porcelain, Herold developed and produced a number of bodies and glazes of considerable industrial value. He was a sincere and earnest technical student and followed closely the German technical literature of the day. His main contribution to the Art Ware industry is possibly his development of the copper red glaze, a glaze better known to connoisseurs as the Chinese ox-blood or Rouge Flambe. This glaze, as its name implies, is a brilliant blood-red and can only be obtained by the reduction of copper, a process in the present state of ceramic practice involving a consumate knowledge of kiln operation and manipulation.

Herold was without doubt one of the greatest practical potters of the day. The fact that his activities were mainly concerned with industrial activities of ordinary size does not diminish the importance of his accomplishments in the minds of those who have closely followed his work.

It is to be regretted that he never had the opportunity of working with those who could either appreciate him to his full value, or who could adequately create conditions where he could work to the best of his ability.

For the purely personal side, he was both modest and unassuming so far as his accomplishments were concerned, but he possessed a commanding and forceful personality, characteristics which coupled with his knowledge and experience enabled him to direct the production of widely varying types of ceramic wares under most unfavor-

able conditions, and more often than not with the help of comparatively unskilled labor.

He was a fine, fearless and upright character and was loved by all who knew him. His passing is a great loss to the industry.

NOTES AND NEWS

DR. GEORGE K. BURGESS: NEW DIRECTOR OF THE BUREAU OF STANDARDS

The President has appointed Dr. George K. Burgess to the Directorship of the National Bureau of Standards. The appointment is a happy one, for Dr. Burgess is the outstanding member of the staff both with respect to his scientific attainments, his successful administration of the Division of Metallurgy, and the large and helpful contact which he has established with the industries. Dr. Burgess is of old New England stock. He was educated in the public schools of Newton, Massachusetts, the Massachusetts Institute of Technology, and the University of Paris. The latter institution conferred on him the degree of Doctor of Science, with highest mention. He was successively assistant in Harvard College Observatory, instructor in physics at the University of Michigan and at the University of California. In 1903, he was appointed Assistant Physicist in the Bureau of Standards. His work in pyrometry was notable and his published work on the laws of radiation and their application to high temperature measurements laid the scientific foundation for pyrometry as applied in American industry. In 1913, Dr. Burgess was made Chief of the Division of Metallurgy. His organization and program are models of scientific research organization. His published work includes some 75 titles and covers such important fields as railway materials, metals and metallurgy, high temperature measurements, general physics and science, and the organization of scientific and technical research. He has served as expert on many national and international commissions, and is an active member of the technical committees of numerous national societies. At the present time he is President of the American Society for Testing Materials.

DR. GEORGE K. BURGESS.

VOLUNTARY ADOPTION OF STANDARDS OF QUALITY

By JULIUS H. BANNER[1]

Among numerous topics of interest to the members of the Chamber of Commerce of the United States contained in the Annual Report of Secretary of Commerce Hoover for the year 1922, there is one to which I particularly desire to invite your attention. Under the heading "Voluntary Establishment of Grades and Qualities" Secretary Hoover has the following to say:

[1] President, U. S. Chamber of Commerce.

"Agitation has been current for many years for the extension of the Federal laws to the establishment of grades and qualities of different commodities. The lack of such established grades and standards of quality adds very largely to the cost of distribution because of the necessity of buying and selling upon sample or otherwise, and because of the risk of fraud and misrepresentation, and consequently the larger margins in trading. It was considered by the department, however, that it would be infinitely better if such grades and qualities could be established voluntarily in the trades themselves instead of by legislation, and policed by trade associations as is the case in several old established trades. To this end a number of conferences have been held in different branches of the lumber, textile, paper, and other trades. The service of the department has been to bring the different branches of the trade, the manufacturers, wholesalers, retailers, and representatives of larger consumers' associations together and to develop committees of different branches of trades. The plan has been generally welcomed and applications have been received from many trades for such assistance. The expert services of the Bureau of Standards, Bureau of Foreign and Domestic Commerce, and the other bureaus of the department have been brought into service for technical advice in these matters, and results of important bearing upon the improvement of business ethics and cheapening of distribution have been attained."

Voluntary Action Preferable to Legislation

This topic of voluntary action of business men to establish definite grades for various lines of merchandise should be of especial interest to the organization of the National Chamber. Shoe manufacturers, textile manufacturers, and others have been worried by snap-judgment proposals to set up so-called "pure shoe" and "pure fabric," etc., standards by government action. Of course, the reputable American business man is not afraid or unwilling to sell his goods on reasonably drawn specifications or to stand back of the quality of his product to a reasonable extent. There is nobody better qualified to pass on what is and what is not reasonable as a standard of quality or performance than those who are in the trade itself. Here, as Secretary Hoover points out, is undoubtedly a field for voluntary action on the part of producers, manufacturers, and merchants in establishing grades and setting standards of quality or performance, with which the consumers will be sympathetic.

Quality Standards Cut Down Commercial Disputes

Business is facilitated and the ground for commercial disputes between buyer and seller is narrowed down if sales are made on the basis of standard grades of merchandise, perfectly familiar to both buyer and seller. This is a phase of business of particular importance in international transactions, where different trade practices and different conditions exist. In a good many foreign countries there has been loss of good will for particular American dealers as well as some lingering prejudice to the good name of American business generally, which can be traced to the lack of understanding and agreement between buyer and seller as to the qualities entering into transactions, or to the absence of standards of quality and performance. When such standards exist, backed up by the moral force of a trade association or trade group in the United States, the promotion of the sale of American merchandise of a given kind and the building of good will toward American trade abroad are made easier, and rest upon a sound foundation.

Many Commodities Already Sold on Standard Qualities

There are a good many commodities sold extensively in the foreign trade for which quality standards commonly understood and accepted here and abroad are in effect,

either as a result of government action or as a result of voluntary action by the trade. The following commodities are exported largely on the basis of such quality standards: Grains—including wheat, oats, corn, barley, rye, rice, kafir, etc.; cotton, cottonseed products and other oil products and by-products; tobacco; coal; petroleum products; lumber; fertilizers; flour; meats and provisions; preserved and salt fish; fresh and dried fruits; canned goods; food specialties and drugs. In the year 1921 these commodities alone totaled in value about $2,700,000,000, or nearly two-thirds of the total export trade of the United States. In addition, copper and other metals, cement, various chemicals, iron and steel products, and a whole range of engineering material, and other commodities shipped abroad in considerable volume are sold on the basis of known specifications or known standards of quality and performance.

Important in Domestic as Well as Foreign Trade

I want to call this subject directly to the attention of the chambers of commerce, and the trade associations—especially the latter—in the membership of the National Chamber. Standardization, and the setting up of systems of inspection and certification in some cases, have made most progress among lines of raw material and food stuffs sold in bulk and moved in large amounts. The full possibilities of doing business on standards of quality have not yet been realized, even in many such lines of merchandise. It is, of course, not only in the foreign trade, but in the whole wide range of domestic trade that the use of clear standards, easily checked up, may be developed. The American Society for Testing Materials, and many other organizations represented in the American Engineering Standards Committee are making great progress in setting up and improving national standards on engineering products. The applicability of the same principles to numerous lines of manufactured specialties is well worthy of consideration by trade associations and chambers of commerce.

Opportunity for Action by Associations

In lines of merchandise where conditions warrant the adoption by representative trade associations of certain definite standards of quality or performance, the associations can hold to account any member failing to make delivery up to the standards adopted, and incorporated in sales contracts. Disputes arising in connection with such transactions readily lend themselves to settlement by the parties themselves, or by commercial arbitration.

Inspection Facilities

Some commercial and trade associations not only set up standards, but go further and provide rules and facilities for inspection and certification of merchandise. Costs must be kept down. With all due recognition of this fact, however, where actual inspection and certification of individual shipments do not add disproportionately to the costs of merchandise, and do serve a useful purpose, associations may well consider the possible desirability of making some arrangements, either with existing bureaus, laboratories, or other agencies doing commercial work of sampling, inspecting, testing, and certifying, or of actually setting up such accommodations if they do not exist adequately for the needs of the particular industries as those needs grow.

Coöperation by Government and Chamber

A good many association executives, and a good many manufacturers who at first have been skeptical of the possibility of setting standards in their particular lines, have gone to Washington and sat in with the members of the Federal Specifications Board,

and participated in the drafting of workable specifications for all federal government purchases in their lines. In the case of some commodities the federal specifications thus adopted are actually becoming used in private trade. The Bureau of Standards of the Department of Commerce has at all times shown a disposition to go as far as it can with the business men in working out technical specifications. There are laboratory and testing facilities here, provided by the tax payer, which may be availed of for this purpose. The director of the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, has expressed the willingness of the chiefs of the commodity divisions in that Bureau to work with associations in this matter of standards of quality, particularly as they bear on the foreign trade. Our Department Managers in the different departments of the staff of the Chamber of Commerce of the United States are desirous of coöperating with any organization undertaking or extending this class of work.

NOTES FROM THE BUREAU OF STANDARDS

Service Tests of China Tableware

The Bureau of Standards has arranged for a series of service tests of hotel china at several prominent hotels. The tests have already been started at the Biltmore Hotel in New York and will be commenced at other places in the near future. Samples of the plates tested will be sent to the Bureau for laboratory examination, and large lots of the same ware will be put in service and examined from time to time in order to correlate the service given by the plates with the laboratory results.

Meeting of the Committee of the Federal Specifications Board on China and Glassware

The Federal Specifications Board's committee on china and glassware, at a meeting on March 26, adopted a list of sizes and shapes of chinaware and glassware which was accepted by all members of the committee. The resulting list shows a very considerable cut in the variety of sizes and shapes besides being definite and simple, and it will be used in obtaining bids. Drawings of all these articles have already been made and exhibited to all members of the Potters' Association so as to make certain that the articles adopted as standard are made by practically all manufacturers of this type of ware. It so happens that the potters are arranging a standard list of hotel ware in which only those articles are enumerated which are made by all potters for hotel and railroad service. The list adopted by the committee is similar to the list which the potters expect to adopt with very few exceptions.

A meeting will be held next month of potters, hotel buyers, representatives of the Pullman Company, and the Federal Specifications Board for the purpose of agreeing upon a final list.

Coefficient of Expansion of Glass Pots

The relation between the coefficient of expansion of the material from which the glass pots are made and that of the glass is an important matter, since it influences the cracking of either the pots or glass or both during cooling. During the month, the Bureau of Standards has measured the coefficient of expansion of three pieces of glass pot bodies, two being of the same composition but cooled in different ways while the third was of another composition. The values show a uniform increase from 0° to 700°C (the

limit of the test) of about 0.04 micron per cm. per degree Centigrade which is much less than the corresponding value for borosilicate glass, this value being 0.1 micron. Therefore, the only explanation for the tendency of borosilicate glass to break in pots, even with slow cooling, is that the relative strength of the glass is less than that of the pot.

ANNOUNCEMENT: THE NATIONAL TERRA COTTA SOCIETY

At the Annual Meeting of the National Terra Cotta Society at Atlantic City, N. J. April 21st, 1923, Mr. E. V. Eskesen, President of the New Jersey Terra Cotta Company, was elected President of the Society for the ensuing year. The remaining officers are: Mr. O. W. Ketcham, First Vice-President, Mr. Adolph Hottinger, Second Vice-President, Mr. Walter Geer, Jr., Treasurer and Mr. F. S. Laurence, Executive Secretary.

Mr. Eskesen was knighted by the King of Denmark April 30th, 1923, being decorated with the Order of Danebrog in recognition of his services in promoting the common interests of the Danish-American peoples, especially in the interchange of university scholarships, etc. between the two countries.

PRIZE FOR NEW IDEA

Members of the AMERICAN CERAMIC SOCIETY will be interested in noting the offer of a prize of $50.00 by the Vitreous Enameling Company of Cleveland for a *new idea* for an enameled product. Suggestions are to be sent to the Company on or before July 1, 1923, and the winner will later be announced in the pages of the *Bulletin*. Full details of this announcement are to be found among the advertisements of this issue of the *Journal*.

CALENDAR OF CONVENTIONS

AMERICAN CERAMIC SOCIETY (ANNUAL MEETING)—ATLANTIC CITY, FEB. 4, 5 AND 6, 1924.

AMERICAN CERAMIC SOCIETY (SUMMER MEETING)—TOLEDO, DETROIT AND VICINITY, AUGUST 8, 9, 10 AND 11, 1923.

American Chemical Society—Chemists' Club, N. Y. City, June 8.

American Dental Trade Association—Spring Lake, N. J., June.

American Electroplaters' Society—Providence, R. I., July 2–5.

American Face Brick Association—First Week in December.

American Face Brick Association (Southern Group)—West Baden, Ind., November.

American Gas Association—Atlantic City, Week of Oct. 15.

American Institute of Chemical Engineers—Wilmington, Del., June 20–23.

American Society for Testing Materials—Chalfonte-Haddon Hall Hotel, Atlantic City, June 25, 1923.

Clay Products Association—Chicago, Ill., Third Tuesday in each month.

Dental Manufacturers' Club of the U. S.—Spring Lake, N. J., June, 1923.

Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18.

Manufacturing Chemists' Association—New York, June.

National Association of Window Glass Manufacturers—Place and date not determined.

National Exposition of Chemical Industries—New York, Sept. 17–22.

National Lime Association—Hotel Commodore, New York City, June 13–15.

National Symposium on Colloid Chemistry—University of Wisconsin, June 12–15.

Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.

Society for Steel Treatment (Eastern Section)—Bethlehem, Pa., June 14 and 15, 1923.

Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

Vol. 2 July, 1923 No. 7

EDITORIALS

EDUCATIONAL TRAINING IN CERAMIC SCIENCE

Science is a general term covering both the fundamental and the applied knowledge of things and processes.

Collegiate education is a systematic training in the finding and marshalling of proven facts and theories in the solution of problems.

The acquiring of an education, the knowing how to find and use knowledge is a gift possessed by men in varying degrees. The simple minded or deficient person, cannot acquire much of an education; he has very little capacity for finding and using knowledge. To some, an education comes naturally; they observe and search for whatever knowledge pertains to the things in which they are interested. To others, education is not so natural. Ability to paint, sing, orate, spell or to be a mechanician, electrician or builder is a talent. Education is a talent which is developed by some people more easily and to a larger degree.

There is no artist, musician or mechanic who attains proficiency by any method other than systematic, diligent practice. Those who have the guidance of trained teachers acquire proficiency in their talents much more quickly, and their special talent is more broadly and thoroughly developed.

The retention of an acquired proficiency in a given talent also requires constant practice. Practice not only makes more perfect, but is abso-

lutely essential to sustained ability, whether it be as an artist, artisan or scientist.

There are specialists of many kinds in music, painting, crafts and writing. Talents of all sorts find their best development and expression in some special way or line. An inventor of electrical things would not, as a rule, have skill or ability to invent in other lines. A first class architect would, as a rule, do poorly as a sculptor, and a pianist would not do equally as well as a violinist. A few exceptional people have more than one talent highly developed, but these are the exceptions.

So it is in education. It would be idle for one to attempt acquisition of ability to find and apply knowledge in any other than the line in which he has a special talent. Bankers, merchants, preachers and lawyers are such by choice, but their choice was dictated in most cases by natural ability to serve in the vocation chosen.

Ceramic industries need specialists. They require the services of artists, salesmen, scientists, electricians, managers of men and financiers. Manufacturers of brick require the services of some artisans having talents and education in lines not required by the table ware manufacturers. The technical tasks for which graduates of ceramic schools are employed differ sufficiently in brick and pottery to require a different sort of view point and adaptability. The brick industry is more in need of a constructive engineer, and the pottery of a physical chemist, yet the technical man for each of these industries could well be prepared by the same sort of educational training. They could with profit have searched the same portion of the world's accumulation of knowledge (recorded facts) and could have had the same practice in analyzing and applying this knowledge to definite problems. These two men, each having had the same sort of educational training, will still possess a natural difference in adaptability to do industrial work because of their differences in points of view, interest and talents.

Since the view-points, interest and talents in the field of industrial ceramics are not developed in the young school fellow until after he has made a partial survey of the field it may be difficult to say what difference in preparatory training each should have for ceramic service. Rather than an instructor passing judgment on the pupil's adaptability, and rather than leaving it to the lad's blind choice as to what special training he should have, it may be better to give all the same course of rigid and thorough training in the searching and analyzing of knowledge for the solution of arbitrarily chosen practice problems.

The writer of this editorial does not believe in the one course of training for all, and yet he realizes the practical limits in variation of courses of training which any one school can offer. Elective or optional courses are not practical, for these do not give opportunity for the most beneficial

systematic development of the youth's educational possibilities; it risks too much to his unintelligent choice and whims, dictated as these are by social and other ambitions outside of his educational training in ceramics.

It did seem practical to the writer when he outlined the first courses in ceramic training at the University of Illinois to have two distinct courses—one engineering and the other science. The judgment then used was reversed by those who later had charge, but affirmed still later when others again instituted the two courses.

The problems of fabricating and burning are, to a large extent, the same in all clay working. If one can succeed as an engineer in a brick plant he ought to succeed equally well in a pottery as far as the engineering problems of flow of ware through the factory are concerned. One of the most original and successful china ware superintendents in this country spent several years making, installing and operating brick machinery prior to taking a short industrial course in ceramics at a college.

The glass and enamel industries wish their ceramists to deal with chemical and physical problems in the uniform production of high quality glass having certain properties, and to devise the furnace and its control in which the glass or enamel is produced.

In pottery, wall tile, floor tile and terra cotta there are similar physical and chemical problems in mixtures and colors and in the use of these in meeting trade demands. It requires more than mere maintenance of quality, reproduction of samples and technical control of plant operations. To serve in those ceramic industries where new effects, color combinations and new products are the essentials to continuing in business the ceramic chemist must be ever awake to development and promotion of new things. He must also either possess a constructional imagination and an artistic conception, or he must be closely allied and in close sympathy with men who possess these creative talents. The ceramic chemist must be more than a compounder of glazes, colors and bodies. He must conceive and know how to execute, as well as to provide the materials and mixtures.

The terra cotta industries are in need of ceramic chemists who can go along with architects in the conceiving of architectural effects. It is the task of the ceramic chemist who serves most fully in terra cotta to execute with the modeler and sculptor the conceptions of the architect and to be able to appreciate, understand and interpret the dreams of architectural artists.

The present day manufacturing conditions make it profitable, if not necessary, to be ready to diversify factory products. The wall tile and sanitary ware factories are now making bath-room fixtures in china. From the producing of these to the making of similar products for widely different purposes is natural. The grinding wheel factories are now producing refractory articles and non-slip tile. It pays ofttimes, from

an operating standpoint, to have a diversity of product. The necessity for a variety in art pottery is more generally understood but the same holds true in architectural tile and in decorative table ware.

No matter how well the ceramic chemist may be trained in the production of bodies, glazes and colors, and in the technical control of processes, he will be a failure and destined to assignment to routine tasks unless he is creative and unless he keeps abreast with the market possibilities. This requires that his interests, studies and activities shall extend beyond the laboratory, clay shop and kiln house. It requires that the ceramic chemist shall commune in person and through the literature and organized associations with those whose creative imaginations include the use of things which his factory can produce. It requires that he shall ever be familiar with all methods and processes for producing ceramic wares. He must know and have evaluating appreciation of both the fundamental and applied science researches that create information on ceramic materials, mixtures and processes.

There comes no time in one's active practice as a ceramic technologist when he can afford to cease searching the world's literature and communing with fellow ceramists. There comes no time when he can fail to know the best method of analyzing problems, and the source and use of materials. His educational training cannot be allowed a let-up. He must continue systematic searching by methods of his own devising.

One's fund of knowledge, cannot be greatly increased. While learning new facts, old ones are being forgotten. This is why the progressive and successful ceramist has his own card index of recorded knowledge, and why he values so highly the abstracting of the world's ceramic literature which appears in this *Journal* each month.

No matter what collegiate training and talent one may have had in the use of knowledge, he will make good only by keeping in contact with his fellows and by extending his activities beyond the factory and laboratory routine to the creative and promotional. One must have both the *incentive* and the *ability* to create; and this incentive does not often come to a recluse.

The educational training essential to the fullest success as a ceramic technologist is beyond the possibilities of college lecture halls and laboratories and can be acquired only by individual effort in collaboration with fellow ceramists and users of ceramic products. He who considers his course of training finished should be ready to retire by choice, for retire he will. It is that he may continue and broaden his educational training that the AMERICAN CERAMIC SOCIETY was founded and is continuing.

The success in service as a ceramist is more dependent upon the educational habits and system which one continues while employed than upon educational training received in school. This is made very evident by

many ceramists of ability, who either have had no special scholastic training or, at the best, have had only a brief collegiate course.

Collegiate training is of value, but of more value is the continued searching and applying of knowledge and the seeking of inspirations and opportunities outside of and beyond the limits of the routine tasks.

Two of the most effective ceramic educational institutions are the collegiate ceramic departments and the AMERICAN CERAMIC SOCIETY. There are other educational helps, but we submit that, given the self-insistence to improve one's education, the next in importance is participation in the affairs of the AMERICAN CERAMIC SOCIETY and that it is profitable for an employing concern to insist that its technical men and plant operators do so participate.

MESSAGE FROM PRESIDENT GREAVES-WALKER

During the month of June each of the ceramic schools sent out into the industry a number of young men who expect to make ceramics their life work. Most of these young men are now or will become members of the SOCIETY. To them let us, who have passed "through the fire," extend the hand of fellowship.

The SOCIETY, formed by a few enthusiastic technical men, has assumed the rôle of a "Big Brother" to the young technical men entering the industry. The first six months or a year often makes or breaks them in, so far as their career is concerned, and a helping hand, patience, and good advice will in most cases carry them over the rough ground onto the straight road of success.

To the graduates we extend the hand of welcome to our ranks with the hope that they attempt to give to the SOCIETY more, if possible, than they receive from it.

A new ceramic school looms on the horizon. The clayworkers of Georgia have determined to locate such a school at the Georgia School of Technology, better known as "Georgia Tech." Their efforts and determination are the more commendable in that they have decided that whether the State Legislature comes to their assistance or not they will themselves contribute sufficient funds to erect the necessary buildings and kilns out of their own pockets. The interest shown can be gaged by the fact that the *Atlanta Constitution*, one of the leading newspapers of the South, has offered to contribute $8000 to cover the operating expenses for the first year.

The AMERICAN CERAMIC SOCIETY congratulates the clayworkers of Georgia and the South and wishes them every success in this laudable undertaking.

May we again call the attention of the members to the Summer Meeting? Can we not have a record breaking attendance on the splendid trip on the Great Lakes? Make up your mind now to attend with your family, August 8, 9, 10 and 11.

Several very successful Section meetings have been held during the past two months. No better indication that the SOCIETY is alive can be found. The officers realize how much work on the part of a few men is required to make these meetings successful. We congratulate these men and bespeak for them the support of the Section members.

The idea adopted by several of the Sections of holding joint meetings with branches of other engineering or technical societies has proven very successful and is recommended to those Sections which have not as yet tried it.

PAPERS AND DISCUSSIONS

THE COLLEGE ART ASSOCIATION OF AMERICA

By Edwin M. Blake

ABSTRACT

The College Art Association, whose members are principally teachers of art in American Colleges, holds annual meetings for the reading and discussion of papers on the teaching of art, its history, and the principles of design. The twelfth annual meeting was held at the Museum of Fine Arts in Boston and at the Fogg Art Museum of Harvard University, April 6, 7, 1923. The Association publishes *The Art Bulletin*, issued quarterly, in which appear many of the papers presented at its meetings, beside other papers and reviews of books. References to some of the more important articles, including one on "Antique Glass," are given.

Were one asked to mention a few of the most important societies of national extent which minister to art education, he might well answer: The American Federation of Arts, The Eastern and Western Arts Associations, and The College Art Association of America. The American Federation through its large individual membership and by serving as a bond of union between the majority of the leading art societies of the country is able to make its influence cover a wide range. Its particular sphere of activity has been to extend the understanding and appreciation of art by the general public. To this end it publishes the *American Magazine of Art*, holds annual conventions, and circulates lectures and exhibitions. The Eastern and Western Arts Associations, whose large memberships consist of teachers of art and manual training in the grammar and high schools, are especially concerned with methods of teaching in those schools and the awakening of art interest in the younger students. The College Art Association has necessarily a smaller number of members who are principally teachers of art in the colleges, universities, and higher technical schools of the United States, and its interests chiefly fall under three headings: methods of instruction and contents of courses in art for the higher institutions of learning; history of art; and the technique and principles of design. The object of the present paper is to briefly describe those activities of the College Art Association which would seem to be of interest to the members of the Art Division of the American Ceramic Society.

It is the custom of the College Art Association to hold annual meetings at about Easter time, lasting two or three days, at which papers are read and discussed, local art collections visited, and social functions enjoyed. The twelfth annual meeting was held at the Museum of Fine Arts in Boston and at the Fogg Art Museum of Harvard University, April sixth and seventh, 1923. Other places of meeting during recent years have been New York, Cleveland, Washington, and Philadelphia. The Association publishes, *The Art Bulletin*, of which the first four numbers appeared annually, but beginning September, 1919 it has been issued quarterly.

Beginning with Volume V, September, 1922, the size has been increased from octavo to quarto permitting larger illustrations of objects of art. One of the undertakings of general interest carried through by the College Art Association is the publication of a list of "Books for the College Art Library" (*Art Bulletin*, Vol. III, 1920, pp. 3–60), a comprehensive bibliography of the fine and decorative arts, the result of several years' work by the committee in charge.

Under the heading "Art Education" may be mentioned the discussion on "What kind of technical art shall be taught to the A.B. student?" which took place at the sixth annual meeting at Cincinnati in 1917, and papers by Prof. Pope of Harvard University and Miss Kallen of the Boston Museum of Fine Arts on "The Teaching of Drawing and Design in the Secondary Schools" (*Bulletin* No. 3, 1917). In the fourth number of the *Bulletin* (1918) is a paper by the late Prof. Arthur W. Dow of Columbia University, "A Course in Fine Arts for Candidates for the Higher Degrees," and one on "Technical and General Education in the Arts" by Director E. R. Bossange of the Carnegie Institute. Other papers of note are "Schools, Colleges, and the Industrial Arts," by Richard F. Bach of the Metropolitan Museum of Art (*Bulletin*, Vol. II, 1920, pp. 171–175); and "A National Program of Industrial Art Education" by Charles A. Bennett (*Bulletin*, Vol. III, 1920, pp. 84–91). At the twelfth annual meeting of the Association a paper "Certain Thoughts upon the College Art Problem" was presented by Miss Alice V. V. Brown of Wellesley College, and one on "The Teaching of Drawing and Painting in the College" by Prof. Arthur Pope of Harvard University. If the members of the Art Division of the AMERICAN CERAMIC SOCIETY do not already know of these papers we would call attention to them, since they constitute a considerable body of expert opinion by many of the leading educators of the country in the art field.

On the subject of history, the College Art Association has had a number of valuable papers presented to it concerning drawings, paintings, and sculpture, which we need not stop to consider but pass on to one dealing with ceramics, an exceptionally important original study of "Antique Glass" by Gustavus A. Eisen (*Bulletin*, Vol. II, 1919, 87–119), which furnishes historical notes on the several periods of antiquity producing glass, a detailed and illustrated account of the technical steps employed in its manufacture, a key to the classification of antique decorated and mosaic glass, and a bibliography of the subject. Reviews of the following works on Greek vases have also been published: J. D. Beazley, "Attic Red-figured Vases in American Museums," Harvard University Press, 1918; J. C. Hoppin, "A Handbook of Attic Red-figured Vases, signed or attributed to various masters of the sixth and fifth centuries B.C.," two volumes, Harvard University Press, 1919; Mary A. B. Herford, "A Handbook of Greek Vase Painting," Longmans, Green & Co., 1919 (*Bulletin*,

Vol. II, pp. 42, 123, 178, respectively). At the twelfth annual meeting Prof. Homer E. Keyes of Boston urged the study of early American artistic crafts, specific mention being made of the glass industry and the beginnings of the potteries at Trenton.

Under the heading "technique and principles of design" may be mentioned a plea for "The Necessity of Developing the Scientific and Technical Bases of Art" by Edwin M. Blake (*Bulletin*, Vol. II, pp. 31–38), "Dynamic Symmetry—A Criticism" by the same author (*Bulletin*, Vol. III, pp. 107–127), "The Application of the Munsell Color System to the Graphic Arts" by Arthur S. Allen (*Bulletin*, Vol. III, pp. 158–161), and "Color Analysis as a Way to Develop Personal Choice in Color Grouping" by Clifford H. Riedell of Smith College. The last mentioned paper, presented at the twelfth annual meeting of the Association, was illustrated by a large number of diagrams in color. In connection with the paper of Prof. Pope, already mentioned, color studies by his students, following the system of Prof. Dennan W. Ross, were shown. Also Prof. Pope insisted on the value of a sound and liberal education to the artist, and in the matter of technical training for the painter pointed out the distinction between medieval times and our own. Formerly the artist was trained in an established workshop having well-defined methods based on traditions handed down from the past. Now those workshops have passed away and present day procedure must be based on rational study of the chemical, physical, and other factors involved. This is doubtless the best way, if carried out, but unfortunately much of modern painting shows both absence of ancient tradition and of any rational procedure to take its place.

Here should also be mentioned two other papers read at the twelfth annual meeting. "The Use of Autochrome Slides as Illustrations for Lectures" by Prof. Holmes Smith of Washington University, discussed the advantages and disadvantages of those slides and showed how truthfully they can render paintings in color. "Some Results of the First Year's Work in the Formation of the New Series of Photographs of Sculpture" by Prof. Clarence Kennedy of Smith College, makes report of an undertaking which has excited widespread interest on account of the splendid lifelike photographs of sculpture which he has produced. In the first place the piece of statuary is cleaned as completely as possible. Many ancient marbles carry various stains and incrustations which may, with care and labor, be removed without injury to the original surface. Then the piece is thoroughly examined by placing it in various positions and lights to determine which is the best to bring out its salient characteristics—trials which may take two or three days. Skilful photographing followed by painstaking development, printing, and mounting are necessary to the final excellent results. These details have been mentioned because it would seem there must be many pieces of artistic terra cotta, vases, and other objects of

ceramic art, both historic and modern, which might well be photographed, for purposes of instruction, by the careful methods of Prof. Kennedy.

While at Boston and Cambridge members of the Association were enabled to visit the Boston Museum of Fine Arts, The Fogg Art Museum and the Germanic Museum of Harvard University, the private collection of Mrs. John L. Gardner at Fenway Court, and the gallery of Mr. Desmond Fitzgerald in Brookline. Besides many masterpieces of painting, ancient sculpture and furniture in the Gardner Collection, there is a Roman pavement from the Villa Livia in the beautiful inner "Court" surrounded by the "Gothic Cloisters," two pieces of terra cotta by the della Robbias, and several quaint tile floors by Henry Mercer of Doylestown, Pennsylvania. Mr. Fitzgerald has a noteworthy collection of French paintings, a great number of water colors by Dodge Macknight, some interesting ancient Chinese porcelains, and a remarkable collection of Corean pottery of the Korai Period, dull gray green in color with white underglaze decorations.

BROOKLYN, N. Y.

IMPORTANCE OF PURE RESEARCH ON GLASS IN AMERICAN UNIVERSITIES

By ALEXANDER SILVERMAN

ABSTRACT

A discussion of the importance of a systematic study of the properties and reactions of chemical substances utilized in glass manufacture. A long list of problems in pure research is given, most of which would directly benefit industry through their practical application. The organization of a glass manufacturers' association for the purpose of subsidizing this research in colleges and universities is recommended. The value of research to corporations and other associations is indicated.

One of our largest manufacturers of electrical machinery maintains a research laboratory which has cost millions of dollars. As a result, metals and alloys, insulating materials, etc., have been studied for their specific properties, and these have been listed and cross-indexed so that any department in the factory may look up a material of certain properties and utilize it without delay. This research department must pay, or the company would not continue to employ high-salaried investigators and spend such vast sums on the researches. It is a well-known fact that two German dye manufacturers employed over one thousand chemists before the war, many of them Ph.D.'s. Although only five per cent of the problems undertaken were successful, the companies were able to pay over twenty per cent per annum to their stockholders. The industries cited are unquestionably better able to spend considerable sums for the maintenance of research laboratories than any of our glass manufacturers, except a few of the larger corporations. The glass industry as a whole, would, however,

derive appreciable benefit, if each company through a "Glass Manufacturers' Association," contributed a moderate sum towards the maintenance of pure and applied research. This has already been attempted by manufacturers of refractories, paper, paint and other materials, and the fruitful results have added to the profits of many of the members of such associations. In some instances, individual companies, still retaining membership in the association, have installed private research laboratories at their plants.

Costly instruments of precision are required for careful investigation. These are found in the laboratories of chemistry and physics in our colleges and universities. Other equipment, such as melting furnaces, is generally lacking. Thousands of students enroll annually for study towards the advanced degrees, Master of Science and Doctor of Philosophy. Many of the professors of chemistry and physics are men of long experience and mature judgment. The salaries required to employ these men would prove prohibitive in most of our glass plants. A "Glass Manufacturers' Association" receiving nominal contributions from a large number of members could arrange to endow fellowships at $1000 each in several of the best universities, and by defraying the cost of installation of furnaces and accessory devices, promote pure research on glass which would prove of incalculable value to the industry as a whole. Professors in charge of science departments will carefully choose men to handle these problems and the men, in turn, will naturally take an interest in the field for which they prepared, so that glass manufacturers who want to employ them later, may secure the technical service of scientists, well trained in the fundamentals of glass science, and receptive to practical plant training, operation and control work. Today, when the manufacturer wants a chemist or physicist who has some knowledge of the glass field, our educational institutions must of necessity say "we haven't one." State appropriations and private endowment funds hardly suffice to meet the universities' needs in training students in the ordinary fundamentals, to say nothing of specialized training.

Would it prove of interest and value to your company to know that you could substitute this material for that one and lower the cost of manufacture while still maintaining the quality of the ware? Would you substitute another material to improve the quality of the glass at the same cost or even at a slight advance? Would you eliminate stones, cords, striae, blisters and seeds if you could? Does the color of your glass change at times, though you have not changed the quantity of coloring or decolorizing agent? Wouldn't you like to know how much of this or that material is lost in melting the batch? Would full economy in the operation of your plant seem desirable? Wouldn't you change your batch to prolong the life of pots or tanks? Does the size of your cullet pile worry you? Would you learn how

to reduce it? You may think that these are plant problems, but in reality they are pure research problems as well, and the fundamental principles on which their solution depends are applied "every day, in many ways" in the graduate departments of our universities, ultimately proving of value to industry.

Forty of the eighty-eight known chemical elements have been used (either free or in their compounds) for glass making. Many of the others may never have utility in the field. Some undoubtedly will. But what of the forty? Do we know all about their application or that of their compounds? Hardly. Let us stop to enumerate a few of the things we do not know.

What portion of the original sodium carbonate is lost in melting an ordinary soda-lime batch? How much more, if any, is lost when we melt the batch with cullet? How do variations in lime or silica content of the batch influence the alkali loss? How do variations in furnace temperature affect it? How does the loss in pots, compare with that in crucibles or tanks? How does the melting rate or size of container influence loss? What influence do various quantities of alkali have on the container during the melt? What effect do they have on the finished product as to durability, permanence of bright surface and influence on contents of bottles, for example? We have very little definite information, yet soda ash has long been used in glass making, probably over 3000 years, if we include the natural soda employed in Egypt.

Some manufacturers employ limestone, which may be almost pure calcium carbonate, or contain magnesium carbonate up to forty-two per cent. What are the effects of variation in magnesium carbonate between these limits, on the glass? Is the same furnace temperature and duration of melt desirable? Does magnesia embrittle the glass and promote devitrification though it lowers the coefficient of expansion? Can anything be introduced into the batch to offset the undesirable properties produced in glass, so we may still use it and obtain desirable effects? Would it be better or worse practice for uniformity and economy to use burnt (quick) lime, or slaked (hydrated) lime, instead of limestone? Lime and limestone also have a long history in the glass industry, and we may know more about them than we do concerning most other materials, but much is still unknown that pure research would bring to light.

Sand is surely a common material. How do grain size and shape, beside composition, affect melting conditions? At which furnace temperature will the sand dissolve soonest? How does the fluidity of the flux govern this rate? Should we use equivalent amounts of various alkali compounds or substitute so as to retain the same viscosity in the flux? Should the viscosity be controlled by varying the amount of alkali, or by adding another chemical to retain desired alkali equivalent and still get proper fluidity?

What are the limits for sand, soda and lime in soda-lime glasses at various temperatures? The last question and a few similar ones have been partially answered through pure research.

How do common impurities affect glass? Is the alumina from sand and other raw materials and that dissolved from pot or tank walls beneficial or objectionable? If beneficial, would the introduction of alumina into the batch lower attack on refractories and prolong their life? Alumina permits of a higher lime content in glass. Does this improve the glass and what are the exact relations between the lime and alumina?

Is there any advantage in using red lead instead of litharge? How much niter is necessary in lead batches to prevent reduction? Can this be figured from the batch, or must the furnace gases be taken into account? Does the oxidation by niter continue long enough during the melt to do what tradition claims for it? Is lead reduced by the repeated introduction of the hot baits of blow-pipes? Can we find substitutes for pearl ash to insure resonance in fine flint table ware? Cannot resonance be estimated like refractive index and expansion coefficients?

Are certain chemicals compatible in the batch? Should lead and sulphur compounds appear together? Will selenium work in lead batches? What are the relative effects of coloring agents on soda-lime batches, lead-potash batches and other combinations used in making colorless glass? Is arsenious oxide an oxidizing or reducing agent in glass? How does it affect the color produced by iron compounds at various temperatures?

What are the proportions of aluminum and fluorine in compounds which will produce certain densities of color in batches of various types? How does the addition of zinc compounds, of boron compounds, of sulphates, of chlorides, influence the color? Are best results obtained in open or closed melting units? Why do glasses containing the same quantity of aluminum and fluorine strike when certain chemicals are employed in the batch and not when others are present? How is the composition of the glass related to dispersive power and light transmission?

How are annealing temperature and period to vary according to composition? How do annealing conditions affect color, glass surface, subsequent behavior in storage, etc.?

Selenium produces a red color in zinc-potash glasses in the presence of cadmium sulphide, arsenious or antimonious oxide and a reducing agent. How does the color compare with that obtainable in soda-lime, potash-lime, zinc-soda, and lead glasses? What are the best proportions for the coloring agents? Can alumina replace zinc? May other sulphides be substituted for cadmium sulphide? Will other cadmium compounds answer as well as the sulphide? Are selenium compounds better than the element? How do selenium reds compare with the colors produced by the related elements, sulphur and tellurium? Do fluorides affect the color? Is reheating neces-

sary to bring out the red? If not, how can it be eliminated? What influence does the reheating temperature and period have on color? Is the glass uniform in color, or are the edges yellow? How can the color be made uniform?

If we have so many problems to solve in the above given partial list of substances containing the few elements mentioned, one may readily imagine how this list can be extended by covering others and adding new elements and their compounds. America is held in renown for her wonderful development of the mechanical aspects of manufacture. She has forged on in scientific progress also. The investment of a little money in pure research in our colleges and universities to supplement that now conducted by the United States Bureau of Standards and the Geophysical Laboratory, would not only materially help our glass industry, but serve to place America in the lead in scientific research on glass. The published researches and work now in progress in the University of Sheffield, England, should serve as an admirable example.

Department of Chemistry
University of Pittsburgh
Pittsburgh, Pa.

COLLOQUIUM ON FELDSPAR SPECIFICATIONS

Problems Involved in Writing Specifications for Feldspar[1]

By Edward Schramm

The work which the American Ceramic Society is about to undertake in developing specifications for ceramic materials calls to mind the analogous efforts in a wider field of the American Society for Testing Materials. Indeed, writing specifications constitutes the chief activity of the latter Society and we may learn a number of things from their experience and procedure. The first and most important is to go slow. The Committees having these matters in charge report proposed specifications to the appropriate division of the Society; these are first adopted and published as tentative and only approved as final after lapse of a considerable period of time and subjection to searching criticism. We could not do better than follow this procedure. If our Society is to make a serious effort to write specifications, it will be necessary for some of the members, presumably the Committee on Standards, to devote some hard study to the project. A symposium, such as we are holding, cannot be more than an introduction.

[1] See Howard C. Arnold, "The Polarizing Microscope as an Aid to Feldspar Standardization," *Jour. Amer. Ceram. Soc.*, **6** [2], 409 (1923); F. C. Flint, "Feldspar for Glassmakers," *ibid.*, p. 413; M. C. Booze and A. A. Klein, "A Rapid Means for the Determination of Quartz Content," *ibid.*, **6** [6], 698 (1923); "Feldspar Colloquiums," *Bull. Amer. Ceram. Soc.*, **5** [7], 78–101 (1922); **5** [8], 133–47 (1922); **5** [11], 269–95 (1922); "Proposed Tentative Feldspar Specifications," *ibid.*, **6** [6], 163 (1923).

Standard specifications are fully as useful to the producer as to the consumer since they tend to replace a multitude of individual specifications and reduce needless diversity of demand. The specifications cannot entirely take care of the question of *quality* since there are usually matters involved beyond their scope. Thus two foundries may produce gray iron castings which answer the chemical and physical requirements of a certain specification but superior technique in manufacture may render one product far better than the other.

Most specifications deal with manufactured products which are more or less under control. In the case of feldspar we must take the rock as nature provides it, modified of course by selection at the quarry and mill. We cannot, therefore, truly "specify" at all but can only choose what we want out of nature's storehouse. The basic study is, therefore, to find out what that storehouse contains. Every useful feldspar mineral should have a place in our scheme.

It is apparent that we are faced with the larger task of classifying the feldspars according to their ceramic properties. These properties, the most important of which is the fusion point, are determined in the main by chemical composition and degree of grinding. However, there may be other factors involved, such as variations in crystal form and the following question may well be raised: given two feldspars of nearly identical composition, can it be assumed that they will behave the same on firing? We know that of the high potash feldspars some are classed as soft and some as hard. In an abstract of a paper by M. E. Denaeyer,[1] we read that "the analysis of two microclines (triclinic potash-soda feldspars) is considered to indicate that they are built up of three separate components in solid solution." From the same source,[2] according to Gossner, "attempts to deduce from the chemical composition of a crystal the constitution of the corresponding molecular unit are fallacious. . . . By postulating the existence of a limited number of simple stable silicates as molecular individuals, the structure of more complicated silicates can be explained as due to combinations of these."

Leaving the somewhat speculative subject of the true molecular composition of the feldspars and its influence on their properties, we shall have to deal chiefly with chemical composition, grinding standards, and fusion point. It will probably prove best to restrict the chemical requirements to the alkali content, establishing different ranges for the several grades. Perhaps more important than the actual composition is the question of constancy; what variation is permissible from an agreed standard of composition? The methods of chemical analysis of feldspar are somewhat tedious but well established and reliable. We are fortunate in having on our pro-

[1] *Ceram. Abs.*, **2** [2], 12 (1923)

[2] *Ibid.*, p. 13.

gram two papers dealing with the application of petrographic methods to the problem. These are obviously quicker but it is a question whether they are sufficiently exact for the purpose.

Passing from the question of composition to that of grinding, we are on much surer ground. Probably the millers will be glad to do as much or as little grinding as they are paid for and it should not be difficult to establish several grades to meet the varying demand. The method of testing must also be agreed upon. The writer believes that washing through a screen of 250-mesh or finer is the most practicable procedure. The coarser screens do not adequately distinguish between poorly ground and well ground materials.

As a supplement to the chemical composition and grinding standards we may include a fusion test under carefully regulated conditions. This test is especially useful where the consumer is drawing on one source of supply as it gives a simple means of detecting sudden changes. It is questionable whether we have the data needed to correlate this test with chemical composition for the different feldspars.

In the foregoing brief survey, the writer has attempted to state the problem and it is hoped that the papers and discussion to follow will lead us nearer to a solution.

Proposed Tentative Feldspar Specifications[1]

Since the last Annual Meeting the Committee has been in correspondence with several producers and large consumers of feldspar.

The consumers are a unit as regards specifying the characteristics of the feldspar they purchase. As might be expected the producers see many difficulties in the way. However great and real these difficulties are, they must be surmounted to the end that the industries which give to feldspar its value may enjoy a greater measure of freedom from uncertainty and consequent loss.

In the September, 1920, *Journal*, "Specifications for Commercial Feldspar and Flint," by A. S. Watts, was published. His noteworthy contributions have assisted all, particularly the thorough work published as *Bulletin* **53,** of the Bureau of Mines, 1913, on the "Mining and Treatment of Feldspar and Kaolin."

It has become the practice of certain manufacturers to use more than one kind of feldspar ground to various degrees of fineness. Feldspar millers are now grinding finer than was the common practice even two years ago. In this connection a series of valuable suggestions has been received from G. E. Sladek calling attention to the fact that, at the present time, feldspars of definitely different composition and definitely different grinding characteristics are in use.

[1] *Bull. Amer. Ceram. Soc.*, **6** [6], 163 (1923).

In view of the above it is suggested that Prof. Watts' specifications be amended as shown in the Feldspar Specifications.[1]

Discussion

SECRETARY TREISCHEL:—The first point is in regard to the sampling of the material.

1. **The Sample.**—In sampling car-load lots, equal amounts should be taken from at least five different points in the car, no two samples being taken within five feet of each other. In sampling from a bin, five separate samples shall be taken from different portions of the bin and not more than two from the same level. The total sample shall not be less than ten pounds.

A MEMBER:—Does it specify the weight of sample?

C. C. TREISCHEL:—Not less than ten pounds. Two pounds from each place.

F. S. HUNT:—Would that prevent the use of an automatic sampler?

A. S. WATTS:—The proposed specification provides for sampling from at least five different points. Where an automatic sampler is used 40 samples can be taken as easily as five. But where there is no automatic sampler it is very simple to get five samples from a carload.

F. S. HUNT:—At least five samples?

C. C. TREISCHEL:—Yes.

F. C. FLINT:—What type of automatic sampler is used?

T. A. KLINEFELTER:—A simple way is to take a brass tube about two feet long, two inches in diameter and put a device on the end so that it permits the tube to fill as it is pushed down, and closes as the tube is withdrawn.

C. C. TREISCHEL:—It is proposed in this specification to have four grades or classifications according to their chemical composition: Grade A with potash content above 10%, and soda content below 3.6%, and total lime and magnesia content below 0.75%; Grade B with potash content above 9%, and soda content below 3.2%, and lime-magnesia content not above 1%; Grade C with potash content above 7.8%, soda content below 2.8%, and a lime-magnesia content not above 1%; Grade D with a potash content not above 3%, a soda content not below 7%, and lime-magnesia content not above 1%; Grade D is to cover the soda feldspars.

R. B. LADOO:—Might I suggest that that gradation does not cover a type of feldspar sometimes met, where the potash and the soda are more or less equal? There should be some combined classification which would show total alkali content so as to take care of these mixed feldspars; for example, one with 5% potash and 5% soda, which is possible. This specification would not cover that at all.

J. M. MANOR:—The feldspar used in the glazes, though it has the higher soda content, is the higher-priced feldspar; necessarily so on acccount of its alkali proportion.

[1] *Op. cit.*

J. P. Rodgers:—The point brought out by Mr. Ladoo is one that ought to have careful consideration. In the short reading I have had of these Specifications it has occurred to me you are treading on your own toes. Of course, as far as we feldspar men are concerned, we can only sell what the potters want and if we have nothing in accordance with their specifications we cannot sell it. But, as Mr. Ladoo says, there is a considerable amount of feldspar on the market not covered in any of these. I believe that 25% of the manufacturing potters are using a feldspar more nearly $8^1/_2$ potash and 4 soda.

When you try to fix the proportion of alkalis you are getting into deep water. I have seldom met with two potters who agree what that proportion should be, hence I really think you had better leave the selection of proportionate contents of alkalis to the individual potter.

For instance, possibly a year ago, I had to make a pilgrimage to the eastern shrine of pottery. I went there not to sell but to get their viewpoints. One man (well-known in the American Ceramic Society) asked me if I had anything new in the feldspar line. I said, "No." Then he said, "Why come here?" I said I came to see if he held the same views as to the composition of feldspar as he formerly did. He said, "I do, and I will say to you that the man who buys feldspar containing 1% of soda is a fool. The man who buys it containing 3% is a fool of a greater degree.

This potter is a very able fellow, yet that is his opinion. To another potter (to whom I do not sell feldspar) I said, "How does this feldspar you are using analyze?" He said that he never asked me for the analysis of my feldspar when purchasing from me and that he had not asked this man. He did not care what it analyzed.

This latter fellow is a successful manufacturer of hotel china, to whom I sold feldspar for twelve years. In those twelve years I got into trouble with him five or six times. Every time it was because the exigencies of the crude feldspar market forced me to change my mix from the usual $8^1/_2$ potash and 4 soda. That fellow was only one of a very considerable number using something approximating that mix.

I think the key to the situation is entirely missed when feldspars are grouped or classified on the basis of character of alkalis. If it is fixed on the maximum silica content of the feldspar there is a long step taken toward the solution of feldspar problems.

B. E. Salisbury:—It would be a fine thing if feldspar could be produced strictly according to specifications, but most potters would like to know what they are getting when they get a carload of feldspar. If some way could be found under which a producer of feldspar would guarantee that his feldspar would answer a certain analysis which he published, with permissible variation in the various ingredients, we shall have gone a long way in advance of anything we have had before. Then it is up to

the individual potter, to select what he needs. He would have the assurance that he would get the same feldspar as long as he got it from one source. The feldspar producers should be able and willing to do a practical thing like that. We cannot hold them down to points impossible for them to reach. There are natural physical limitations which control the product of each feldspar producer. But if we know what we are buying, we could take what we want (at least, that is the way we feel in our company).

Chairman Pence:—Following that suggestion of Mr. Salisbury's I take it, that, if the producer gives us an analysis of his feldspar, guaranteeing that it shall not vary beyond specified limits, we should be satisfied.

B. E. Salisbury:—That would be my idea.

J. M. Manor:—We could go further: Exact from the producer a statement as to just where his feldspar comes from, the particular mine, and also that when conditions vary he shall not without due notice substitute a different feldspar. I have heard this talk about changes in a given feldspar. As a general proposition, these changes are not made, but if a mine is exhausted of one kind and the producer decides that another mine runs about the same, trouble will probably follow if he attempts to slide that in.

C. M. Franzheim:—Can you tell me on what basis these varying alkali bases are to be fixed? Is it on the basis of the way it occurs or on the pottery requirements?

Chairman Pence:—I think it was indicated in the opening remarks that these analyses are attempts to classify. It is really identification rather than grading according to quality. However, Mr. Salisbury has indicated that we could avoid confusion by simply asking for the analysis and specifying that it should not vary beyond certain limits. The consumer would then select what he wants.

C. M. Franzheim:—Has any attention been paid as to whether these proportions really exist?

H. Spurrier:—Yes, you will find these quantities correspond to the feldspar on the market.

A classification rather than specification is what is wanted. I am glad to see the weaknesses brought out. We need something that will cover the quantitative relation between potash and soda.

C. M. Franzheim:—I find a great weakness in these proposed specifications. There is no alumina content. The value of a feldspar is not in its potash content but its relation of content of alumina to that of potash and soda. One customer told me he bought feldspar only for the high potash. He overlooked the fact that the alumina content had some bearing. I see no mention of that. There is great value in the relation of the potash and alumina which should be considered.

F. S. Hunt:—Regarding the alkali percentages: A fifth class to include those feldspars which come between Class D and Class C could be provided,

called Class E, and include all feldspars in which the relation of the soda and potash is between those two limits. That would include all feldspars regardless of the relation between the soda and potash.

CHAIRMAN PENCE:—These specifications are in process or in progress. We do not expect any answer today. The Standards Committee will benefit by the expression of your opinions and knowledge. They will then do further work on the Specifications.

C. M. FRANZHEIM:—I should like to see the Committee investigate the relation of the alumina content with regard to the potash content.

H. SPURRIER:—The alumina content is automatically controlled. Normally speaking, the existence of the alkali controls the alumina.

C. M. FRANZHEIM:—I have seen feldspar with $8^1/_2$ potash that was softer than another having 14% potash, because the alumina content was low. The value of feldspar is therefore not determined alone by its potash content but the proportions between the content of alkalis and the content of alumina.

T. A. KLINEFELTER:—I have made the same observation as Mr. Franzheim relates but in this the soda content was higher. I thought it was of the proportion of the soda to the potash feldspar which made a eutectic. I believe with Mr. Spurrier that the potash content largely controls the alumina content and this softness depends on the proportion of soda to potash. It has been my experience that the total alkali could be low if the soda content is somewhat high.

C. M. FRANZHEIM:—A feldspar low in soda, high in silica, about 70 or 72%, and low in alumina will be a softer feldspar, visibly softer than the feldspar of 13% of potash and high in alumina. It is the relation of these various things to each other that has a big bearing on the value of the feldspar. The high potash feldspar does not necessarily belong in Grade A.

According to these proposed specifications for grading, in the minds of my clients, I would be selling Grade B feldspar, a suggestive situation which I wish to avoid. It is because of the psychology involved in any classification of this sort that I would avoid selling B feldspar. I believe my feldspar is Grade A, commercially speaking. I am speaking from a commercial standpoint and of the impression a classification of my feldspar as "B" would have in the minds of my customers. I do not want a classification and have my customer ask me, "What grade are you selling?" and have to say, "Grade B." He would say, "You are asking high prices for Grade B."

If the trade would understand the purpose of this classification it would be all right, but most of the buyers neither could nor would.

C. C. TREISCHEL:—How would you prevent that psychological idea on the part of the consumer.

C. M. FRANZHEIM:—Grade A would be the best, and B would be second grade. We, here, would understand it differently but to a purchasing

agent and also to many practical plant men Grade B would stand for an inferior product. I am thoroughly in favor of this classification from the viewpoint on which it was drawn but to the consumers Grade A (10% and above potash) would mean that this was the most valuable feldspar whereas I think you would find that it is not in all cases. High potash does not mean greater value.

C. C. TREISCHEL:—That is quite true, but what we need is some assistance for the Standards Committee to work on.

C. M. FRANZHEIM:—That is a hard problem. I should like to see the Standardization Committee, before they adopt anything, visit the various mines and see their problems. They could see what we are up against every day. I am sure they would be welcomed, and they could work with the men who select the feldspar.

B. E. SALISBURY:—I appreciate the psychological effect of this grading. Why not call the best feldspar Grade D?

F. S. HUNT:—Instead of class names, use the same system which the pencil manufacturers use. Classify the high potash feldspar as "K," high soda as "N," your medium grade as "KN," your second grade of potash as "KK," or something of that nature. That would relieve the situation altogether.

A. S. WATTS:—I should like to point out that if a feldspar contains 9% of potash, and $3^1/_2$ of soda, there is $12^1/_2$% of alkali. That feldspar is not going to run over 17% of alumina, is it? Have you seen any running over 18 or 19 with the potash between 9 and 10 and the soda less than $3^1/_2$%?

C. M. FRANZHEIM:—It will not go over 18.

A. S. WATTS:—If the total alkali and alkaline earth is not over 14% and the alumina is not over 18%, there must be 68% of silica. We know that a moderate amount of excess silica makes a softer feldspar, *i. e.*, feldspar that will fuse at a lower temperature.

We buy feldspar for its flux value. If I have a pure feldspar unmixed with flint or quartz with 14% alkali in the ratio of 10 and 4, I can introduce silica as flint bought at a very much lower price than that of feldspar, hence lower than if incorporated with the feldspar. On this basis the high alkali feldspars would properly be of higher value. This, however, is not the solution of the problem we have here.

I do not think the question is how much alkali or soda or alumina they shall contain as it is to find out what we are going to establish as a standard. The consumer as a rule has his own definite idea of what is meant by a No. 1 and No. 2 feldspar. He evidently thinks a No. 1 feldspar is a more or less definite article. I realize that the producer is going to object to classifying his feldspar if it puts it into a class that appears low. That is normal and fair. I believe, however, that the scheme of classifications here proposed is logical. It does not mean you will sell by it. It simply means that when

you say your feldspar is in a certain grade the man buying it has a general idea of its analysis, that is, this classification gives an interpretation to the analysis placing the feldspars into groups having a definite limit of permissible variations in composition. It seems to me that a fair classification can be based on reasonable limits of compositions.

I believe, also, that a classification based on the fluxing value of a feldspar can be established. As we know, the standard cone is constant within very small limits, and if a classification is based on the cone temperature at which the feldspar will fuse by itself and will fuse when mixed with 10 or 20% of added flint, I believe the feldspar producer and consumer both would have valuable information. And it is easily obtained. You do not need a week to make the fusion test of feldspar.

One word about the potash-soda content. There are two feldspar producers present who are prepared to furnish a feldspar with 8% of potash and 4 or $4^1/_2$% of soda. One of these feldspars is standard. Is this a blended feldspar?

J. P. RODGERS:—It is a natural blend.

A. S. WATTS:—It seems to me we must make a distinction between mill blended feldspar and a natural blended feldspar. A blended feldspar will vary in ratio from 5% of potash and 7% of soda to 7% of potash and 5% soda. We should differentiate between natural potash feldspars in which a small amount of soda is naturally present reducing the potash in the rock, and the mixture which is made up of a potash and soda feldspars intimately associated. I think we ought to call that a blended feldspar or by some other name to differentiate from the perthite in which potash feldspar is replaced in rock by soda feldspar in small amounts.

SECRETARY TREISCHEL:—The next points were "Physical Properties and Test:"

1. Color and Specking:

Bearing in mind the variety of wares in which feldspar is used and the various standards as to color and specking potters find it necessary to establish, it is considered desirable to leave this matter open to agreement between vendor and vendee.

In other words, if a buyer gets up a set of specifications and bases his specifications on this classification, he can put in almost anything he wants.

2a. Fineness of Grain:

One hundred grams of the sample, after being dried to constant weight at 105°C shall be tested for fineness of grain according to the process set forth in paragraph 2b and the residues on the various sieves shall not exceed the maxima as set forth in the following table:

Screen No.	100	140	200	270	325	Total residue
Grade 1	0.25	0.5	1.25	2.0	5.0	9%
Grade 2	0.50	1.0	2.5	4.0	6.0	14%
Grade 3	0.75	1.25	3.75	5.0	8.0	18.75%

For the screen analysis the Standard Screen Scale sieves are used, the openings increasing in the ratio of the fourth root of 2 or 1.189, as recommended in *Year Book*.[1] All percentages are on the dry basis.

Is there any discussion on the fineness of grain as to those grades? In making up a specification from a classification like this you could have grade "K," and according to fineness, "K-1;" or grade "K," according to fineness, "K-3," which would be a little different. A thing of this sort is very flexible.

R. B. LADOO:—I notice that you specify residues on many different screens. That would be almost impossible to approximate in practice because the residues on various screens depend not only on the physical characteristics of the feldspar but upon the method of screening. If you specify residues on five different screens it is much like trying to draw a circle between five different points. You cannot do it. You should specify a limiting screen. For example it might be specified that all should go through 80-mesh (limiting screen) and $98^1/_2\%$ should go through 200-mesh. With these limits set, the residues on other screens will be automatically regulated by the method of grinding and the physical properties of the feldspar.

C. C. TREISCHEL:—That point seems to me to be well taken. I have found that same variation in material coming from continuous grinding and from batch grinding.

H. SPURRIER:—These are supposed to be maximum figures. You could hardly expect a hard and fast specification. It was expected a good deal would be altered. These quantities come within the limit of my own experience as far as that goes. It was impossible for me to go specifically outside of that. My experience is not wide enough. I want it corrected, amended or rejected. Whichever you do, it is open to objection. It is desirable to have intermediate sizes and to know about them and if you only cite limiting points you are escaping or missing something that is very useful. At the same time I agree you are trying to draw a circle in the five points. Whichever you do you have to draw our circle inside the five points.

P. H. BATES:—It is a matter of carrying the specifications into effect. Screens will differ. Take some with the Bureau of Standards certificate and they will give you half a dozen different results. With the same sample on the 200-mesh screens there was a difference of 5%. That is a difference in the operators. The A.S.T.M., which are the standard, allow a tolerance of 2% on the 200-mesh screen. But that specification said 80% should pass the 200-screen. An operator who got 78% would pass it. Unless you take that into consideration you are going to have considerable difficulty

[1] *Jour. Amer. Ceram. Soc.*, **5** [4], Pt. 2, p. 36 (1922).

and the only person to make anything out of it will be the referee laboratories.

A. A. KLEIN:—Screens which check first will vary in time just from use.

J. M. MANOR:—That agrees with my observations. I think it would be a more fair proposition if Grade No. 1 on screen No. 140 were changed to .7 of 1% and 200 changed to 2%, on the basis of what it has been customary to furnish with satisfactory results to the trade; that is unless there is a desire to have it still finer than what they have been using.

A. S. WATTS:—We find as has been stated, that in the course of time screens will deteriorate but we have not found that that was extremely serious and I believe that by introducing a moderate tolerance you will not have a great deal of difficulty.

We have not been able to justify the use of more than three screens. I think three screens would suffice. With 100- or 80-mesh and the 200 and 325 a classification would be obtained which, with a reasonable tolerance, would be sufficiently accurate. The main thing in this screen classification is to have an operator of sufficient training or experience.

F. V. DRAKE:—I think you will find that the aperture in the screen made by the different manufacturers of screen, whether it says 200 or whatever it is, is controlled entirely by the diameter of the wire used in the manufacture of the screen. In the screening of your material the diameter of the wire used gives the aperture through which the material passes. You get a different gage wire and in that way you get a different aperture in your screen.

H. GOODWIN:—We find grinding plays an important part. This is one thing to be considered; the denser a semi-porcelain body the greater will be the tendency to dunting in kilns, and I suggest that in making up the classifications that this be taken into consideration. Of course, this can be overcome in part by proper balance in other body materials, or by giving kilns sufficient time to cool properly before opening up, but in these days of speed, kilns cannot be thrown over from one day to another in drawing, hence, the necessity of considering the fineness in grinding.

H. SPURRIER:—I propose that the schedule be amended to cover, say 6% plus. In other words, we have here what is desired and we accept 6% beyond that for each screen. For instance, on the 100-mesh, Grade 1, we have 0.25. We would tolerate 6% on the .25; or (25 × 1.06) or 0.265, which in the total will amount to more than is specified here. That would be enough to take care of the personal factor in making the tests. It is very difficult to take care of that. But a reasonable amount of care is presumed in all these things.

G. E. SLADEK:—We have conducted screen tests on all our flint and feldspar for ten years and the boys who do that are in high school. We showed them how and we found that, having two boys run the same tests,

we got little variation. We checked them with a standard. These screens have been used for some time and we find there is very little variation due to wearing. I think if the screen tests are conducted with any reasonable care you can get very accurate results on carload shipments.

R. B. LADOO:—The method of making the fineness test, as specified, seems unduly complicated. It is suggested that a simpler and probably equally accurate method is that used in the Washington Office of the Bureau of Mines. The procedure of screening is the same as that described except that the material is washed through the screen by means of a water spray from above instead of by splashing from below. A rubber tube is attached to a water pipe and a gentle spray made by pinching the end of the tube together with the finger. This method of sieving is more rapid than that recommended in the specifications and there is no danger of loss by slopping or by overflow. By this method all lumps are easily broken up and there is no danger of forcing the screen wires apart if a gentle spray is used.

SECRETARY TREISCHEL:—The next item is:

3. Moisture Content:

Unless otherwise specified the purchase price shall be based on moisture free material and the moisture content shall be determined as follows: 50 grams of the sample (paragraph 1) are carefully weighed out as soon as possible after sampling, and placed in an oven where a temperature between 105°C and 110°C is maintained with proper ventilation till the sample ceases to lose weight, and the loss in weight shall be calculated to per cent of the dry weight and so reported.

In case a suitable chemical balance is available the moisture test may be determined on a 5-gram sample.

Anything with reference to that on moisture content?

T. H. SANT:—I believe that was brought up a number of years ago. Most of the grinders will agree that it is almost impossible to load absolutely dry feldspar on account of the dust. You could not get workmen to unload it and you would not want it unloaded. Would not 2% moisture be acceptable?

C. C. TREISCHEL:—This classification does not restrict either the producer or the vendor to any certain water content. It just mentions the fact that purchase is desirable on the dry basis.

4. Fusion Behavior:

Test cones of the feldspar shall be made of standard dimensions, *i. e.*, $2^7/_8$″ high (75 mm.) by $^9/_{16}$″ (15 mm.) across the base of one face. The use of an organic bond such as dextrine or gum arabic, is permissible to ensure cones retaining form prior to fusion, but such added material must burn out completely and not affect the color of the fired material. The fusion behavior of the different feldspars shall be as follows for the grade 2 grind:

Grade A Feldspar shall fuse with or before Orton Cone 9
Grade B Feldspar shall fuse with or before Orton Cone 8
Grade C Feldspar shall fuse between Orton Cones 7 and 8
Grade D Feldspar shall fuse with or before Orton Cone 7

A MEMBER:—What of the potter who claims his maximum cone test is cone six?

J. B. SHAW:—Does this require that the fusion test will be made according to the test as adopted by the Standards Committee?

C. C. TREISCHEL:—All specifications from the SOCIETY will be referred to the Standards Committee and they will put in such things.

J. B. SHAW:—I asked that because it is a known fact that the cone at which the feldspar will fuse depends very largely upon the atmospheric conditions of the furnace and the time of fusion. It is necessary to specify most carefully those conditions before you could adopt anything very rigid in this matter.

C. C. TREISCHEL:—That point should be considered by the Committee in revising these classifications.

The next item is "Shipping:"

5. Shipping:

All material purchased under these specifications shall be shipped in clean closed cars.

6. Rejection:

The purchaser reserves the right to reject material which does not conform to the above specifications in every particular and to return rejected material to the vendor for full credit at price charged f.o.b. point of delivery specified by purchaser.

I am afraid that is going a little bit beyond a scope of a classification which is to be used as the basis for specifications and I personally would object to seeing this in a classification put out by the SOCIETY.

R. B. LADOO:—I have not noted any provision made for decisions on either analyses or screen tests or anything else.

A. S. WATTS:—Do the fusion temperatures indicated for Grades A, B, C and D line up with the compositions of the same data? I question whether a feldspar containing 10% or more of potash and 3.5% of soda and fusing at a temperature of approximately cone 9 could be diluted with flint until it had a composition of 8% potash, 2.5% soda and would fuse between cones 7 and 8. I do not believe that you would get that lowering of the fusion temperature due to simple dilution by flint. Can anyone on the Committee tell me if these tests have been carried out?

H. SPURRIER:—Not on feldspars of this composition, but closely related compositions and some of them taken from your own writing on this. I drew very freely on that, as on your specifications.

J. P. RODGERS:—The albites will fuse on cone 6, but a year ago I heard a member of this SOCIETY connected with the Terra Cotta Division state in the court room, under oath, that they would fuse at cone 3. I do not know whether they will or not. I have had tests of them made where they were well fused at cone 6. I never saw anything better than that.

A. S. WATTS:—Is it not true that albites contain a relatively high content of lime and magnesia?

J. P. RODGERS:—The Atlantic Terra Cotta Company told me that these particular albites contained about $2^1/_2\%$ of magnesia and lime.

J. M. MANOR:—With regard to the question just raised by Mr. Ladoo: How are these disputes going to be settled as between the producer and receiver? Both think they are right and both may be honest. How will it be settled?

C. C. TREISCHEL:—I think this whole matter will be taken up during the year. We want to take it up on the coöperative basis between the producer and consumer. These classifications have been made up in great part from the viewpoint of the consumer. This matter of variation in feldspar, of the desirability of classification and specification has been before us now for about three years. The only group who seems to have gotten anywhere have been the consumers. We have always welcomed the producer to get in and it has been our desire to have the producer present something definite. He will be requested to do that during the coming year, so that things of that sort will be worked out and a final classification presented possibly this year.

F. S. HUNT:—I should be very glad if the producers submit letters giving their ideas in writing. We have not had their opinions in writing to work on. We have had analyses, of course.

W. A. HULL:—I have been during the past year Chairman of the General Standards Committee of the SOCIETY and I am willing to accept full responsibility for the fact that these standard specifications were presented to the White Wares Division in present form to go through a process that specifications ought to go through in the Standards Committee.

Mr. Spurrier has done what I consider a good job for a one-, two- or three-man job, but Mr. Spurrier will agree with me that it was not a committee job. This is not as it should be. The fact is that if this SOCIETY is to work on specifications we must have Standards Committees that are large enough and representative enough to represent the best thought of all interests in the Division. A one- or two-man committee or four-man committee so situated that we can not get together and discuss these things and wasting the time of fifty men instead of ten or twelve is not right.

I wish to move that the White Wares Division has for the coming year a Standards Committee of not less than ten men, that producers be represented on it, that the Committee be selected if possible in such a way that it shall have a secretary who has stenographic help and shall be made up of men as far as possible whose concerns can afford to send them to at least three meetings in the course of a year, that this work that has been done here may be done up right during the coming year so that we shall

have the same sort of work that other societies that are really working on specifications are able to do.

The motion made by Mr. Hull was seconded and adopted, with the provision that the three meetings proposed should be held on dates other than those of the annual and summer meetings of the SOCIETY.

C. C. TREISCHEL:—Is there any formal disposition you want to take on this more or less formal classification you have before you?

It was moved, seconded and adopted that the proposed specifications for feldspar be referred back to the Committee on Standards for revision.

P. H. BATES:—Two other specifications I think have been referred to the General Standards Committee. I do not think they are any better or any worse than this one. Are you to reconsider your action on that and send them all back?

SECRETARY TREISCHEL:—I think as far as this Division is concerned we have done as much as we can on those. They have been referred to the General Standards Committee for further revision if they see fit.

W. A. HULL:—The General Standards Committee will make such disposition as seems best. They will probably refer them to the Standards Committee of this Division. The General Standards Committee is not so constituted that it can work on things of interest to but one Division. It is more coördinating. On any material of special interest to one Division the Standards Committee of that Division should do the work and put it forth in good form.

Do We Need Graded Specifications on Feldspar?

F. C. FLINT:—Is it necessary that we should grade feldspar according to its content of soda, alumina or silica, choosing certain percentages to call A, B or C grade? The mental implication that a B or C grade is inferior to an A grade is always present, which is a hindrance to the producer. The limits set for allowable variation inside of the grades is wide enough to be noticeable in use if shipments varied from one extreme to the other. Grading A, B or C according to cone fusions is only another way of stating that the feldspar fuses at cone 8 or 9. It would be simpler terminology to use the cones. Feldspar goes into such a variety of ware that it would be, strictly speaking, a difficult thing to make one specification of feldspar fit all kinds of material.

By way of example, coal would be graded A for coke use, B for producer gas, C for domestic, D for cannel. These grades could be made by analyses and soft coal is more uniform than feldspar, so could more easily be classified. But experience has shown it better to buy by analysis and size, stating the allowable limits of variation from the analysis.

Would it not be better to insist that the feldspar be purchased under speci-

fications giving its chemical analysis, grinding size, fusion, color, etc. This analysis to include not only alkalis, alumina and soda, but also all other elements appreciably present, for the magnesia and calcium contents affect its action as well as the chief ingredients. The fineness of grind should be expressed in a complete manner, showing the percentages on a number of screens, not percentage held on some one screen. The fusion should be given and also as soon as it is practical to do it, the content of other minerals, free silica or quartz, mica, hornblende, etc.

If a purchaser of feldspar obtains good results with any one typical specification, it would be very important to him to know what allowable free limit there should be in the various percentage constituents, sieve tests, etc.

The limits allowed by grading as proposed must be so wide that variation inside the classification could harm some products. To overcome this would make too many grades.

The discussion of specifications has brought out the fact that very few users of feldspar would use exactly the same specifications on the same ware and at the same time the producer would be hampered in trying to sell a feldspar which he could not change, but which specifications by their simpleness had made people try to use. In other words, if some large user of feldspar took a notion to a certain grade, there would be a tendency for other users to follow his grade, when probably their conditions would permit them to use another type of feldspar and some producers would be unable to fit the conditions.

Such a system would be more complicated in that each man would in a way set his own standard, but it would be simpler in that the standard is given directly in terms of constituents and not by an arbitrary set of grades. In glass alone there are a possible five grades which could be used. How about other products?

ACTIVITIES OF THE SOCIETY

WE ARE GROWING—BUT BRING ON THE TONIC

Thirty-two personal and seven corporations joined in support of the SOCIETY during the month of May 15 to June 14. There have been some resignations on account of withdrawal from the field of ceramics but a count of the membership cards checked by a ledger count shows that on June 14th the membership totaled 2030

The records are as follows:

	Personal	Corporation	Total	Net gain
June 14, 1923	1792	238	2030	203
January 14, 1923	1611	216	1827	338
January 14, 1922	1350	139	1489	

Comparison of the records from January to June 14th in 1922 and 1923.

	Personal	Corporation	Total
Net gain from Jan. 14 to June 14, 1923	181	22	203
Net gain from Jan. 1 to June 14, 1922	175	33	208

The SOCIETY lost 16 personals and 2 corporations during this last month by resignation. These losses are charged in so that the figures for June 14 are net as checked by actual count. This gives reason for the increase in 1923 up to June 14 being a little less than for the corresponding interval in 1922, but an enterprising man will neither give nor accept excuses for not doing better in this year of prosperity than was done in the slow year of 1922.

What are you, my fellow member, going to do about this? Do you feel the call to "be good to yourself" and to your neighbors? Will *you* not invite others to join?

The record of the individuals who have helped in keeping up the membership records for the period from May 15 to June 14 is as follows:

	Personal	Corporation		Personal	Corporation
H. Frost		1	Robt. V. Miller	1	
H. Goodwin		1	C. H. Modes	5	
W. J. Vollrath		1	L. M. Munshaw	1	
M. F. Beecher	1		C. L. Norton	1	
W. J. Benner	1		B. S. Radcliffe	1	
E. Hogenson, Jr.	1		Robt. Twells, Jr.	2	
R. K. Hursh	2		Otto W. Will	1	
R. N. Long	1		Office	14	4

Total 32 Personal, 7 Corporation

NEW MEMBERS RECEIVED FROM MAY 15 TO JUNE 14

PERSONAL

Anderson, Louie S., Terra Cotta, Ill., Head Kiln Burner, American Terra Cotta Co.

Arthur, Edwin P., 8 University Place, Columbus, Ohio, Chemist, U. S. Window Glass Co.

Barnard, Randolph H., 810 Henry St., Alton, Ill., Batch and Furnace Dept., Illinois Glass Co.

Brown, Henry C., 98 Fulton St., Woodbridge, N. J., Lab. Assistant, Federal Terra Cotta Co.

Burt, William I., Maple Grove, Ohio, Chemist, The Dolomite Products Co.

Carhart, Daniel L., 2326 Edwards St., Alton, Ill., Asst. Supt., Illinois Glass Co.

Dinsmore, Francis W., Imperial Porcelain Works, Trenton, N. J.

Feder, T. M., Special Representative, Illinois Electric Porcelain Co., Macomb, Ill.

Geer, John D., Newell, W. Va., Ceramic Assistant, Knowles, Taylor and Knowles Co., East Liverpool, O.

Gouin, Roland J., 1025 George St., Alton, Ill., Plant Chemist, Illinois Glass Co.

Hasselmann, Mario Fred, Caixa Postal 1546, Rio de Janeiro, Brazil (New York, P. O. Box 122, Station F), Industrial Manager, Comp. Constructora em Cimento Armada.

Hutchinson, O. C. K., 311 Prospect St., Alton, Ill., Industrial Engineer Illinois Glass Co.

Jeffery, Benjamin Alfred, 741 Edison Ave., Detroit, Mich., Vice-Pres., Champion Porcelain Co.

Kanhäuser, Dr. Frank, Chodov u Karlovych Varu, Czechoslowakia, Managing Director, Dr. Tonder and Co., Refractories Works.

Lahey, John A., Sewaren, N. J., Chemical and Metallurgical Director.

Lamar, Mark O., Worcester, Mass., Chief Chemist, Norton Co.

Lambert, Kenneth Coghlan, 208 S. 18th Ave., Maywood, Ill., Student.

Lava, Vicente G., Bureau of Science, Manila, Philippines, Physical Chemist.

Lyons, Okey A., 5345 Belvidere Ave., Detroit, Mich., Dressler Kiln Operator, Champion Porcelain Co.

Magid, Hyman Singer, 2639 Rice St., Chicago, Ill., Student.

Martin, P. W., Dry Branch, Ga., Pres., American Clay Co.

McKeown, Thomas H., 434 Laurie St., Perth Amboy, N. J., Chemist, Roessler and Hasslacher Chemical Co.

Norton, Frederick H., Mass. Inst. of Technology, Cambridge, Mass., Babcock and Wilcox Co.

Purcell, Buruette, 5811 Manchester Ave., St. Louis, Mo., Ceramic Eng., St. Louis Terra Cotta Co.

Reed, Gordon W., 407 S. Dearborn St., Chicago, Ill., Staff, *Brick and Clay Record.*

Robinson, Chas. J., 107 Gibson St., Canandaigua, N. Y., Efficiency Engineer, Lisk Mfg. Co., Ltd.

Schabacker, H. E., 917 W. 6th St., Erie, Pa., President, The Erie Enameling Co.

Stevens, W. P., Bibb Bldg., Macon, Ga., Manager, Dixie Fireproofing Co.

Stohl, L. A., Sun-Prairie, Wis., Box 725, Gen. Mgr., Standard and Specialty Porcelain Works.

Topliff, George C., 713 Main St., Alton, Ill., Foreman, Illinois Glass Co.

Walters, Durwood B., 1407–47 S. 55th Ct., Cicero, Ill., Special Representative, Chicago Vitreous Enamel Products Co.

Wenning, J. W., 3313 Allendale St., Corliss Sta., Pittsburgh, Pa., Supt. and Vice-Pres., The Vitro Mfg. Co.

Corporations

Alberhill Coal and Clay Co., 1204 Lane Mortgage Bldg., Los Angeles, Cal., James H. Hill.

California Pottery Co., 579 Mills Bldg., San Francisco, Cal., J. F. Creegan, Secy.

The Falcon Tin Plate Co., Niles, Ohio, W. T. Brangham, Gen. Mgr. of Sales.

The H. K. Ferguson Co., 6523 Euclid Ave., Cleveland, Ohio, H. S. Jacoby, Secy.

Los Angeles Brick Co., 514 Security Bldg., Los Angeles, Cal., Gen. Mgr., L. S. Collins,

Mineral Products Co., 50 Congress Street, Boston, Mass., Frank P. Knight.

Polar Ware Co., Sheboygan, Wis., W. J. Vollrath, President.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

E. E. Ayars gives Little Genesee, N. Y., as his address for the summer.

Earl Baldauf, who received his B.S. degree in ceramics from Ohio State University in June has accepted a position with the National Tile Co., at Anderson, Ind.

Leo A. Behrendt writes that his address is the Midland Terra Cotta Co., 105 W. Monroe St., Chicago, Ill.

George Blumenthal, Jr., of Alfred, N. Y., has recently affiliated himself with *Brick and Clay Record,* 407 South Dearborn St., Chicago, Ill.

J. S. Brogdon writes that his mailing address is Box 1864, Atlanta, Ga.

Horace T. Brown has removed from Alton, Ill., to 65 Hampton St., Bridgeton, N. J.

Lawrence H. Brown has severed his connection with the E. M. Knowles China Co. at Newell, W. Va., and has accepted a position with the Findlay Electric Porcelain Company, at Findlay, Ohio.

Joseph L. Buckley has changed his address from Rock Island, Ill., to the Hipper Bldg., Des Moines, Ia.

Edward Burkhalter, ceramics student at Ohio State University, is living at 1978 Iuka Ave., Columbus, O.

H. D. Callahan has moved to 436 E. Long St., Columbus, Ohio, from Keyport, N. J.

H. M. Christman gives as his address, Wooster St. Ext., Massillon, O.

Hugh Curran, 1923 graduate at O. S. U., has gone to his home in Bakersfield, Cal.

James R. Goodwin, who has been living at 1267 Kenilworth Ave., Coshochton, Ohio, has moved to 921 May St., East Liverpool, Ohio.

John Grainer requests that his mail be sent to Spring Lake, Mich. Mr. Grainer has been living recently in Hamilton, Ohio.

S. E. Hemsteger who received his degree in ceramic engineering has gone to Mt. Clemens, Mich., where he is employed by the Mt. Clemens Pottery Co.

Carl G. Hilgenberg writes that his correct address is Baltimore, Md. Mr. Hilgenberg is President of the Carr-Lowrey Glass Company at Baltimore.

W. M. Hughes, third year ceramic student at O. S. U., will be in Zanesville, Ohio for the summer.

A. A. Johnson who has been in Chicago, Ill., is now living at 529 Christie St., Ottawa, Ill.

Robert M. King, graduate student in ceramics at O. S. U. for the past two years received his Master's Degree in ceramic engineering in June. His mailing address at present is Box 373, Maryville, Tenn.

L. P. Kraus, Jr., Vice-President of the Kraus Research Laboratories, Inc., 110 West 40th St., New York City, is at that address, having left the Babcock and Wilcox Co., at East Liverpool, Ohio.

Albert Krekel is living at 2903 Chelsea Terrace, Baltimore, Md.

Wm. H. Lucktenberg, formerly Vice-President and General Manager of the Burton-Townsend Co., at Zanesville, Ohio has resigned his position. He is spending the summer with his family at Buckeye Lake, Ohio.

T. Poole Maynard gives as his new address 220 Hurt Bldg., Atlanta, Ga.

Crawford Massey, ceramics student, O. S. U. will be at 555 Moxahala Ave., Zanesville, Ohio for the summer.

Paul R. Morris, chemist with the Pittsburgh Plate Glass Co., has removed from 300 E. 9th Ave., Tarentum, Pa., to Charleroi, Pa.

C. H. Myers, superintendant of the Utah Fire Clay Co., wishes to notify his friends that he can be reached at Salt Lake City, Utah. His recent address has been Murray, Utah.

Paul Q. Quay of Euclid, Ohio, has moved from Euclid Ave., to Lake Shore Blvd., opposite 246th St.

R. J. Riley of the Indianapolis Terra Cotta Co., Indianapolis, Ind., has removed to the Brightwood Plant.

John E. Sachs lives at 1221-A Main St., Evansville, Ind.

A. E. Saunders, formerly with the Oriental Art Glass Co., at Chicago has moved to Toronto, Can., where he is manager of the Jefferson Glass Co., Ltd., 338 Carlaw Ave.

William Senn is living at 808 W. Adams St., Sandusky, Ohio.

R. R. Shively, has moved from Fairmont, W. Va., to 311 E. Bean St., Washington, Pa.

Charles S. Shoemaker has notified us that he has moved from Arnold, Pa., to 328 Main St., Belle Vernon, Pa.

Paul Teetor, formerly ceramic engineer with the State Geological Survey, Lawrence, Kan., is now at 12 McKinley Ave., Trenton, N. J.

R. W. Widemann of Paris, France has removed to 30 Rue des Dames (XVII).

Carl G. Zwerner writes that his new address is 29 So. West 8th St., Miami, Fla.

NORTHERN OHIO SECTION MEETING[1]

Minutes

The 17th regular meeting of the Northern Ohio Section, American Ceramic Society, met the Cleveland Engineering Society at their rooms at Hotel Winton, Cleveland, Ohio, Tuesday, April 24th, at 2:30 p.m.

At this business meeting the resignation of Arthur F. Gorton as Secretary of the Section was accepted, and George H. Hays was elected to fill out his term.

The matter of committees was discussed and suggestions made. Since then, Mr. Zopfi has appointed the following committees:

Membership Committee

1. Robert A. Weaver, President, Ferro Enamel Supply Co., 818 Finance Bldg., Cleveland, O.
2. F. P. Nickerson, W. S. Tyler Co., Cleveland, O.
3. L. W. Manion, 1370 Greenfield Ave., S. W., Canton, Ohio.

Program Committee

1. L. D. Mercer, United Alloy Steel Corp., Canton, Ohio.
2. G. T. Stowe, Cleveland Builders Supply & Brick Co., Leader-News Bldg., Cleveland, Ohio.
3. Philip Dressler, 1551 East Blvd., Cleveland, Ohio.

Executive Committee

1. The Executive Committee will be officers and councillor of the Division ex-officio, and
2. A. S. Walden, National Carbon Co., Cleveland, Ohio.
3. William M. Clark, National Lamp Works, East 152nd St., Cleveland, Ohio.

[1] By George H. Hays, Secretary Northern Ohio Section. American Ceramic Society.

The meeting adjourned for dinner, and at 8 o'clock P.M. assembled to hear Ross Purdy's lecture before the joint session of this Section and the Cleveland Engineering Society. The lecture, "Ceramics—The Science and Engineering Involved," was well given and well received by the 100 present. Mr. Purdy held his audience spell bound for nearly two hours, explaining more particularly the close relationship between Ceramic Engineering and Mechanical Engineering. The discussion of this paper lasted over 30 minutes and many very interesting points were brought out. Mr. Philip Dressler was called upon and gave a short and interesting description of the development of the tunnel kiln in this country.

The Section has had many flattering comments about this meeting, especially from the members of the Cleveland Engineering Society who attended.

FORTY-FIFTH ANNUAL CONVENTION OF THE ILLINOIS CLAY MANUFACTURERS' ASSOCIATION AND CHICAGO SECTION OF THE AMERICAN CERAMIC SOCIETY

TUESDAY, MAY 8
LASALLE HOTEL, CHICAGO, ILLINOIS

Morning Sessions

Indiana-Illinois Division American Face Brick Association
Meeting—LaSalle Hotel, 10 A.M.

Illinois Drain Tile Manufacturers' Association
Address, "Where is the End of Drainage?" By J. A. KING.
Meeting—LaSalle Hotel, 10 A.M.

Illinois Paving Manufacturers' Association
Meeting—Association Offices in Chamber of Commerce Building, 10 A.M.

The Hollow Building Tile Association
Meeting—LaSalle Hotel, 10 A.M.

Afternoon Joint Session

Program

"The Relation of Sales to Manufacturing"
By ALBERT H. SHEFFIELD, Secretary, American Terra Cotta Company

"What the Buyer Must Be Shown"
By JAMES A. KING, Editor, National Reclamation Magazine, St. Louis, Missouri

"The Production of Green Colors on Face Brick"
By RALPH K. HURSH, University of Illinois

"Efficiency in Clay Haulage"
By THOMAS N. MCVAY, University of Illinois

Dr. M. C. Leighton, state geologist-elect was present and made a few remarks to the members of the Association.

The following officers were elected for the coming year:
James C. Reeves, President (Streator, Ill.)
W. H. Brosman, Vice-President (Albion, Ill.)
C. W. Parmelee, Secy.-Treas. (Urbana, Ill.)

The Committee appointed to consider the question of the amalgamation of the Illinois Clay Manufacturers' Association and the Chicago Section of the American Ceramic Society reported that the Committee had carefully considered the matter and after consulting with some of the older members of the organization, they had come to the decision that this is not an opportune time for such a plan. They recommended that the by-laws be amended to provide for an Executive Committee which shall consist of the officers of the Association and one representative from each state organization interested in the production of clay wares.

Meeting of the Chicago Section[1]

Following the meeting of the Illinois Clay Manufacturers' Association, the Chicago Section of the SOCIETY, started the evening with a dinner at the Hamilton Club. Desiring to give the Clay Manufacturers something recreational after a rather full day, the evening was turned over to entertainment for the great part, instead of a heavy technical session. A troup of entertainers kept the crowd of forty-five good fellows amused during the meal and for another hour with song and dance and fun in general. After a few words by Mr. Leighton, the new state geologist, this was followed by the projection of the well-known "Tribune Film," showing the manufacture of paper from the Canadian pulp-wood camps all the way down to "Andy Gump" and "Skeeziks." This splendid educational feature was enjoyed by everyone present, and many compliments have already been received. A short Harold Lloyd comedy entitled "Pay Your Dues," closed the program with a gentle hint.

Associations having joint meetings were:

Illinois Clay Manufacturers' Association
Indiana-Illinois Division American Face Brick Association
Chicago Section of the AMERICAN CERAMIC SOCIETY
Illinois Drain Tile Manufacturers' Association
Illinois Paving Brick Association
Hollow Building Tile Association

MEETING OF ST. LOUIS SECTION[2]

The St. Louis Section of the AMERICAN CERAMIC SOCIETY held a joint meeting with the American Society of Mechanical Engineers and the American Chemical Society at the Gatesworth Hotel, St. Louis on May 18, 1923.

W. B. Chapman, member of the AMERICAN CERAMIC SOCIETY and President of the Chapman Engineering Company spoke on "Fuel Saving in Modern Gas Producers and Industrial Furnaces," illustrating his talk by lantern slides and papier-mâché models.

An illustrated talk was given by Paul V. Bunn, General Secretary of the St. Louis Chamber of Commerce, the subject being "A Trip to Cuba, Panama and Costa Rica." Entertainment was also furnished by Station KFEZ, the new radio broadcasting station of the St. Louis Section.

Officers were elected for the year 1923–24 for this Section of the SOCIETY as follows:

Frederick E. Bausch, Chairman
W. J. Knothe, Secy. and Treas.
Geo. E. Thomas, Chairman, Membership Comm.
Chas. W. Berry, Chairman, Program Comm.

[1] By H. E. Davis, Secy., Chicago Section, AMERICAN CERAMIC SOCIETY.
[2] By W. J. Knothe, Secy., St. Louis Section, AMERICAN CERAMIC SOCIETY.

OBITUARIES

Members of the AMERICAN CERAMIC SOCIETY will regret to learn of the death of Ellis Gates, which occurred at his home in Chicago on April 25, 1923. Mr. Gates, son of W. D. Gates, charter member of the SOCIETY, was born in Hinsdale, Ill., in 1880. He received his education in the Hinsdale Schools, the Chicago Manual Training School and the Ceramics Department at Ohio State University. He was connected with the American Terra Cotta and Ceramic Company in various capacities at different times. He was later superintendent of the Denney-Renton Terra Cotta Company and the Seattle Terra Cotta Company. From there he was employed in New York by the New York Architectural Company, later in charge of their Pittsburgh office, then in Mobile, Chicago, Denver, and Santa Fe. During the latter years he was fighting his fatal illness, tuberculosis.

On Monday, June 11, the death of Mr. Joseph Keele of the Department of Mines of Canada, occurred at Ottawa. He was well known for his contributions to the knowledge and literature of the clay resources of the Dominion.

Mr. Keele was born 59 years ago at Birr, Ireland, and came to Canada at the age of 15. He was educated at the University of Toronto and for several years was a member of the staff of the School of Practical Science.

In 1898 he was appointed to the Canadian Geological Survey and performed worthy geological work, including notable explorations in the Yukon and the Mackenzie River regions. Later he devoted particular attention to the Pleistocene formation which finally led to his specializing in the study of clays in general and their utilization. To further fit himself for this, he took a special course in ceramics at Cornell University under Professor Ries with whom he collaborated on the investigation of the clay deposits of the Western Provinces.

For three years he carried on his laboratory work on clays at the University of Toronto. In 1915 he was recalled to Ottawa and was transferred from the Geological Survey to the Mines Branch, for the purpose of organizing the Division of Ceramics. In his capacity as Chief of this Division he was able to be of great aid, as an adviser, to the clay industry throughout the entire Dominion. In 1921 he was transferred, at his own request, back to the Geological Survey.

He leaves, as a record of his contributions to the knowledge of the clays of Canada, valuable reports on the clay resources of all of the Provinces.

He was a member of the AMERICAN CERAMIC SOCIETY, Canadian National Clay Products Association (Honorary Member), Canadian Institute of Mining and Metallurgy, Town-planning Institute of Canada, and the Ottawa Field-Naturalist's Club.

Mr. Keele was a man of broad interests. Although naturally a lover of outdoor life and spending much of his leisure in the open, he was keenly interested in art, literature and music.

Besides his recognized scientific attainments, his enthusiasm and breadth of view were an inspiration and a help to his fellow workers and assistants. In a quiet unassuming way he made many warm friends, and these will sadly miss him.

Official Personnel of Divisions—1923–24

	Art	Enamel	Glass	Heavy Clay Products	Refractories	Terra Cotta	White Wares
Chairman Vice-Chairman Secretary	F. H. Rhead J. C. Boudreau H. S. Kirk	H. F. Staley R. R. Danielson	A. R. Payne J. H. Forsyth A. E. Williams	R. B. Keplinger F. T. Owens Amos Potts	E. E. Ayars F. A. Harvey R. F. Ferguson	A. F. Hottinger R. L. Clare	F. H. Riddle C. C. Treischel
Committee on Research	F. H. Rhead	R. R. Danielson	E. W. Tillotson E. W. Washburn	R. T. Stull G. W. Shoemaker Paul E. Cox R. K. Hursh	M. L. Bell A. A. Klein E. N. McGee A. S. Watts Francis R. Pyne	E. C. Hill Major Gates	F. K. Pence
Committee on Standards (a) Tests (b) Products	W. J. Stephani C. F. Binns	(a) E. P. Poste	Tests: A. E. Williams; L. R. Milford. Refractories: D. E. Sharp; C. E. Fulton; W. F. Brown; A. S. Zopfi; G. Aurien; C. O. Grafton	P. H. Bates W. G. Worcester S. Geijsbeek W. P. Blair	R. F. Ferguson M. C. Booze R. M. Howe	(a) C. W. Hill D. F. Albery (b) J. L. Carruthers	(a) G. Sladek A. V. Bleininger
Committee on Data	Conrad Dressler	T. D. Hartshorn	J. C. Hostetter	H. G. Schurecht	L. J. Trostel F. A. Harvey A. S. Watts	T. A. Klinefelter	C. C. Treischel
Committee on Membership	H. S. Kirk	Karl Turk	F. C. Flint; J. B. Krak; R. R. Shively; G. H. Loomis; C. H. Modes; M. A. Smith; H. T. Bellamy; A. W. Kimes; R. F. Brenner; D. D. Schurtz; J. T. Keenan; H. W. Hess; F. B. Garrod; J. H. Forsyth	D. F. Stevens H. S. Vincent J. E. Randall	J. W. Hepplewhite E. H. VanSchoick Allan G. Wikoff	W. D. Gates G. M. Tucker A. L. Gladding	I. E. Sproat
Committee on Rules	F. H. Rhead		J. W. Wright	C. B. Harrop R. L. Hare W. W. Ittner	S. M. Kier R. M. Howe	R. L. Clare	August Staudt
Rep. on Committee on Nominations	Paul E. Cox	B. T. Sweely	W. F. Brown	C. F. Tefft		E. C. Hill	C. E. Jackson
Councillors	Mary G. Sheerer Hewitt Wilson W. D. Gates Frederic Carder Ira Sproat	H. C. Beasley W. C. Lindemann M. E. Manson D. F. Riess	J. C. Hostetter E. W. Tillotson D. E. Sharp J. Gillinder	C. F. Tefft		G. P. Fackt W. J. Stephani M. C. Gregory	
Com. on Papers and Program	F. H. Rhead				C. C. Bales J. S. McDowell L. C. Hewitt E. O. King M. C. Booze		
Education	J. C. Boudreau						

Personnel of Local Sections

	New England	Eastern	Pittsburgh District	Northern Ohio	Chicago	St. Louis	Detroit
Chairman	C. W. Saxe	Andrew Foltz	Alexander Silverman	A. S. Zopfi	B. T. Sweely	Frederick E. Bausch	F. H. Riddle
Vice-Chairman		Chas. W. Crane	Francis C. Flint	Emerson Poste	W. W. Wilkins		
Secretary		G. H. Brown	H. G. Schurecht	Geo. H. Hays	H. E. Davis	W. J. Knothe	
Treasurer			Thos. H. Sant				
Councillors		Chas. A. Bloomfield	Francis W. Walker	R. D. Landrum	C. W. Parmelee		
Membership			Alexander Silverman	R. A. Weaver F. P. Nickerson L. W. Manion	Alan G. Wikoff	Geo. E. Thomas	
Program			E. Ward Tillotson	L. D. Mercer G. T. Stowe Philip Dressler	D. F. Albery	Chas. W. Berry	
Rep. on Comm. on Nominations			E. Ward Tillotson		D. F. Albery		
Executive Committee		A. Foltz C. W. Crane G. H. Brown C. A. Bloomfield R. H. Minton Abel Hansen Chas. H. Cook August Staudt	A. Silverman A. F. Greaves-Walker E. W. Tillotson R. M. Howe H. G. Schurecht	A. S. Walden W. M. Clark	W. W. Wilkins H. E. Davis D. F. Albery A. G. Wikoff		

NOTES AND NEWS

HIGH HONOR FOR E. V. ESKESEN

Knight of Danebrog Conferred on Local Man by King of Denmark

"The decoration of Knight of Danebrog,[1] has been conferred upon Echardt V. Eskesen, president of the New Jersey Terra Cotta Company for his interests in this country in American-Danish activities, and the part he has taken in the interchange of students between Scandinavia and America. The decoration is one of honor; only two or three other Danes in the United States having been so honored by King Christian X.

"Danebrog is the name of the Danish flag. It is more than 1,000 years old; the oldest flag in the world.

"Mr. Eskesen has been prominent among the Danes of America for many years, at one time being president of the Danish-American Society of the United States. For a period of years he was trustee of the American-Scandinavian Foundation, a fund created by Mr. Poulsen of the Hecla Iron Works to aid in the education of students of Danish parents.

"Besides being president of the New Jersey Terra Cotta Company, Mr. Eskesen is also president of the Royal Copenhagen Porcelain and Danish Arts of 21 West 57th Street, New York City, and president of the National Terra Cotta Society, to which honor he was elected at the convention of the terra cotta industry at Atlantic City on April 20. Mr. Eskesen is also a director of the First National Bank this city and Treasurer of the Matawan Tile Co."

E. V. Eskesen.

At the age of twenty-three he was still holding a clerkship in Copenhagen. The political restrictions of the early 'nineties which, to the free spirited made life seem unbearable, may have contributed to some extent to his longing for the American freedom and opportunities, and it may be that the urgings of three brothers and a sister who had previously come to America was quite an influence but we believe it was the demand for exercise of Mr. Eskesen's inborn ability to achieve that constituted the strongest urging for America, the country where all have equal opportunities for full exercise of talents.

Mr. Eskesen has shown that his interests have been much broader than the earning of a livelihood and that they included others than himself and family. He always loved art, literature and music and sought every opportunity for cultural development of self in these lines. This life of the cultural resulted in contacts with men and ideals which gave a loving and lovable direction to his workaday thoughts and deeds.

The *World's Work* obtained from immigrants of different nations their early impressions of America and why they remained here. Mr. Eskesen's statement appeared in the February, 1921, issue. His simple beginnings and his honorable attainments prompt a statement of his formula for a successful life:—Work, study, love with the

[1] *Perth Amboy Evening News*, May 3, 1923.

cultural arts, and an active helping interest in his fellowmen. The following excerpt from the article in the *World's Work* is characteristic of Mr. Eskesen's ideals:

"Outside the gate I found my younger brother waiting for me. He had been working in a terra cotta factory. So after looking around for a couple of days we secured work as pressers in an architectural terra cotta plant located in Long Island City. It was hard and unusual work for me, my surroundings rough, ugly, depressing.

"The first years of an immigrant's life are always the hardest. These years leave their marks and are never forgotten. For the man who has to fight his way up from the bottom, it is work, work, work—hard, grinding work. But it is not this that leaves its mark—it is the fact that he is made to feel that he is an outsider, a Pariah. My early years in American were before the great influx of immigration from South and East Europe. The word "greenhorn" was then very much in use and was applied to any one who was not born here. It carried with it a stigma, and was meant to hurt.

For me, as for other ambitious immigrants, the first years in America were bare of leisure or recreation. After the hard, manual labor of the day, I went to evening schools to study English, bookkeeping, stenography, and many other things which I found necessary in order to advance myself. It was sometimes two schools in one evening. I had to put aside all those things that represent the finer ideals of life, music, art, literature. I had expected that I would have to give up for a time my writing and poetry; but I had not expected to find my life stripped so absolutely bare of even a reference to these things—the talk around the shop and outside was mostly about baseball and prizefights—so different from what I had been accustomed to in Denmark.

"After about four years of manual labor and study, I found in my selected trade the opportunity for success. The idea of making useful and beautiful things out of clay appealed to me as a happy combination of industry and art, of getting perhaps satisfactorily close to art. I took hold of this thing and stuck to it. The old desires of my boyhood, to rove and adventure, came to me, but I repressed them even though I sometimes felt that in doing so I was bridling part of my better self. I did not, like many of my countrymen, Jacob A. Riis for instance, strike out into the uncertain, wandering from place to place, depending on chance jobs between communing with nature. So my experience as an immigrant is commonplace."

CHANGES IN PERSONNEL AND ASSIGNMENTS

BUREAU OF MINES

Dr. Bowles Superintendent, New Ceramic Experiment Station

Dr. Oliver Bowles, mineral technologist of the Bureau of Mines, has been designated by the Secretary of the Interior as superintendent of the new mining experiment station of the Bureau to be established at Rutgers College, New Brunswick, N. J., which will specialize in problems involved in the production and utilization of the various non-metallic minerals. Dr. Bowles will enter upon his new duties July 1.

Dr. Bowles was born in Canada and educated at the University of Toronto, obtaining his degree of B.A. in 1907, and of M.A. in 1908. The degree of Doctor of Philosophy was conferred by George Washington University in 1922. He was engaged in field work for the Ontario Bureau of Mines during 1908–1910, and was instructor in petrography at the University of Michigan in 1908–09. Until 1914 he lectured on rocks and minerals at the University of Minnesota, and made a comprehensive study of Minnesota quarries. The results of this work have been published as *Bulletin*, No. 663

of the U. S. Geological Survey. Since 1914 Dr. Bowles has been stone quarry and non-metallic specialist in the Bureau of Mines, and has written many technical papers and articles. His labors have recently been directed chiefly toward quarrying problems in the lime industry.

The new station will undertake selected problems in mining, treatment of non-ceramic uses of such non-metallic minerals as bauxite, feldspar, Fuller's earth, graphite, gypsum, limestone, mica, phosphate rock, salt, sand and gravel, slate, sulphur, garnet, asbestos, and talc.

Dr. S. C. Lind, Chief Chemist, Bureau of Mines

Dr. Lind, who will assume the position of chief chemist of the Bureau of Mines on July 1, studied at Washington and Lee University, Massachusetts Institute of Technology, the University of Leipzig, the University of Paris, and the Radium Institute of Vienna. In 1912, while acting as assistant professor of chemistry at the University of Michigan, he was appointed physical chemist with the Bureau of Mines. Later he was detailed to take charge of the Bureau's Rare and Precious Metals Experiment Station at Reno, Nevada. His chief work at that station has been on radioactivity, radium extraction and measurements; the influence of radiation on chemical reaction; and the relations of gaseous ionization to chemical action. Dr. Lind is the inventor of the well-known Lind interchangeable electroscope, used in the examination of rare metals and gases.

Courtesy of Harris & Ewing

DR. SAMUEL C. LIND.

Dr. Moore to Enter Firm of Consulting Chemists and Metallurgists

Dr. Richard B. Moore, chief chemist of the Department of the Interior, Bureau of Mines, has resigned his post to take effect June 1. Dr. Moore will enter the commercial field with a well-known firm of consulting chemists and metallurgists in New York City.

Previous to his governmental service, Dr. Moore was closely associated with Sir William Ramsey, the eminent English chemical investigator, in research work on the rare gases. In 1911 he was appointed assistant chief of the division of chemical and physical investigations in the Bureau of Soils, Department of Agriculture. While with the Bureau of Soils, he became much interested in the possibilities of the development of the radio-active ores of southwestern Colorado and eastern Utah, and this led to his transfer in 1912 to the Bureau of Mines and to his being detailed to establish a rare metals experiment station of the bureau in Denver.

Dr. Moore initiated the bureau's program for the production of radium in the United States from the Colorado and Utah ores, which were being shipped to Europe and concentrated there. By the application of processes developed by radium having a market value of nearly one million dollars was produced through a coöperative

agreement between the Department of the Interior and the National Radium Institute. Dr. Moore was largely instrumental in bringing to the attention of American medical men the value of radium in cancer treatment, and in encouraging the use of mesothorium as a substitute for the infinitely more valuable radium in the manufacture of luminous paint. The widest recognition has been accorded Dr. Moore on account of his investigative work on radio-activity and the chemical separation of radio-active types of matter, on the atomic weights of Krypton and xenon, the metallurgy of rare metals, and the liquefaction of gases. Of recent years he has directed the research work of the Bureau of Mines in the practical recovery of helium from natural gas, and it is largely through his work in the Bureau that the cost of this element has reduced from $1,200 per cubic foot to 10 cents, with the promise of further reduction in cost to 3 or 4 cents.

EXHIBITION OF INDUSTRIALLY MADE TABLE WARE

The Arts and Crafts Club, New Orleans

By Mary G. Sheerer

The Arts and Crafts Club of New Orleans, located in one of the oldest houses in the "Vieux Carre," one that has been illustrated many times as typical of the historic French régime, was established to foster a higher appreciation of the arts and crafts of today.

The Club has constantly changing exhibitions of original paintings and crafts, but none of the industrially made wares have been shown. Awakening to the fact that the large mass of people are using the commercial table wares and that more interest should be taken in what most of us use, as well as having a desire to help educate the taste of the public, a small but very interesting display was held of the Onondaga, Sebring, Knowles, Taylor & Knowles, and Lennox Belleek.

The latter, of course, is in a different class, as decalcomanias are not used, but as it is produced in quantity, it was included. The soft, creamy color of the Belleek with its high degree of finish and rich design would lend distinction to any exhibition.

The Onondaga combines a vitrified, well-finished body with variety and snap to the design and color. Obviously the appeal is made to the more educated public. When we remember that only a few years ago we were eating from a plate covered with a realistic landscape, men and women, cupids, fish careening about, fruit, etc., we realize our taste is improving.

The Sebring is to be congratulated on its choice of form, a portion of it grooved, each piece good in proportion and shape. The simple band design at the edge is perhaps the most appropriate to the form, but the Chinese landscape is very attractive in color and spacing, landscape used as design not as a picture. Some of the other designs seem to have been put on without consideration of the form and style of the body.

The Knowles, Taylor and Knowles, a semi-vitreous ware like the Sebring, has a bird and flower arrangement which is Japanese or Chinese in treatment, and which is in very good taste in design and color.

Most of the designs, however, are characterized by neatness rather than freshness and freedom back of which latter are liked by the public as evidenced by the popularity of the best English and Japanese types.

Newcomb College
New Orleans, La.

U. S. STANDARD SIEVE SERIES[1]

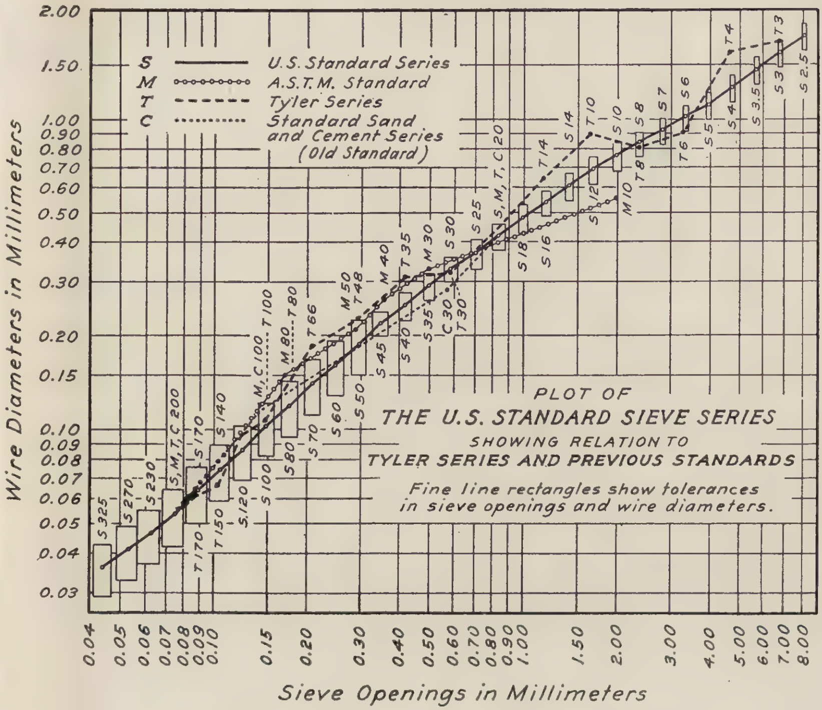


Table of Fundamental Data

Standard Specifications for Sieves

Sieve no.	Sieve opening, milli-meters	Sieve opening, inches	Wire diameter, milli-meters	Wire diameter, inches	Toler-ance in average opening, per cent	Toler-ance in wire diameter per cent	Tolerance in max-imum opening per cent
2 1/2	8.00	0.315	1.85	0.073	1	5	10
3	6.73	.265	1.65	.065	1	5	10
3 1/2	5.66	.223	1.45	.057	1	5	10
4	4.76	.187	1.27	.050	1	5	10
5	4.00	.157	1.12	.044	1	5	10
6	3.36	.132	1.02	.040	1	5	10
7	2.83	.111	.92	.036	1	5	10
8	2.38	.0937	.84	.0331	2	5	10
10	2.00	.0787	.76	.0299	2	5	10
12	1.68	.0661	.69	.0272	2	5	10
14	1.41	.0555	.61	.0240	2	5	10
16	1.19	.0469	.54	.0213	2	5	10
18	1.00	.0394	.48	.0189	2	5	10
20	.84	.0331	.42	.0165	3	5	25

[1] Bureau of Standards, Washington, D. C.

Standard Specifications for Sieves (*continued*)

Sieve no.	Sieve opening, milli-meters	Sieve opening, inches	Wire diameter, milli-meters	Wire diameter inches	Toler-ance in average opening, per cent	Toler-ance in wire diameter per cent	Tolerance in max-imum opening per cent
25	.71	.0280	.37	.0146	3	5	25
30	.59	.0232	.33	.0130	3	5	25
35	.50	.0197	.29	.0114	3	5	25
40	.42	.0165	.25	.0098	3	5	25
45	.35	.0138	.22	.0087	3	5	25
50	.297	.0117	.188	.0074	4	10	40
60	.250	.0098	.162	.0064	4	10	40
70	.210	.0083	.140	.0055	4	10	40
80	.177	.0070	.119	.0047	4	10	40
100	.149	.0059	.102	.0040	4	10	40
120	.125	.0049	.086	.0034	4	10	40
140	.105	.0041	.074	.0029	5	15	60
170	.088	.0035	.063	.0025	5	15	60
200	.074	.0029	.053	.0021	5	15	60
230	.062	.0024	.046	.0018	5	15	60
270	.053	.0021	.041	.0016	5	15	60
325	.044	.0017	.036	.0014	5	15	60

Note: In order to utilize cloth now on the market, it will be permissible, until further notice is given to the contrary, to use wire whose diameter is within a tolerance of 10% for the first three groups and 20% for the last two groups. Until notice is given to the contrary, the allowable tolerances on average openings will be 50% more than those given in the above Table.

Washington, D. C.

STANDARDIZATION OF CRUCIBLE SIZES

By C. H. Rohrbach

The Plumbago Crucible Manufacturers of the United States have recently completed, after more than two years' investigation, planning and experimentation, what is undoubtedly the most important work ever undertaken in that industry, namely, the standardization of crucible sizes on a scientific basis.

Exterior shapes and dimensions were worked out for each size so that they would have a true and uniform relationship to every other size, the basis for capacity being 3 pounds of molten copper per number with an allowance of 10% for working space. It was found that this gave an increased capacity on the larger sizes, but that on the sizes from No. 100 down it gave a smaller crucible than had previously been supplied by most of the crucible manufacturers, and a crucible user who, for example, had been using a No. 50 pot, would have to order a No. 60 in the new size to give him the capacity to which he had been accustomed.

To avoid endless confusion and friction with the trade it was determined to adopt the new standards on the basis that had been developed and step them back to the next lower number covering all sizes below No. 100. The dimensions of a theoretical No. 110 pot were used for the new No. 100 size. Under this plan, practically all of the new sizes come close to the average capacities of the old style pots formerly manufactured, *and the user may continue to purchase the size to which he has been accustomed.*

The "American Standard," as the new sizes are designated, is being received with

genuine appreciation by the trade because of the fact that more than ninety per cent of the crucible output of the country is now being made in these sizes, therefore a crucible user can buy pots from almost any crucible manufacturer and not be compelled to change his tongs to suit each new lot of crucibles that he may want to try out. Needless to say the tong manufacturers welcome the opportunity to standardize on one size of tong for each number of crucible.

The new sizes are as follows:

Standard Sizes of Brass Crucibles

Number	Height, inches	Top, inches	Bilge, inches	Bottom, inches	Approx. cap. in pounds, water
0	2	1 5/8	1 3/4	1 1/4	
00	2 1/4	2	2	1 1/2	
000	2 5/8	2 1/8	2 1/8	1 5/8	
0000	3	2 5/8	2 5/8	1 3/4	
1	3 5/8	3 1/8	3 3/8	2 3/8	.39
2	4 1/4	3 1/2	3 7/8	2 7/8	.78
3	4 7/8	4	4 1/2	3 1/2	1.17
4	5 1/2	4 1/2	5	3 3/4	1.82
5	6 1/8	4 7/8	5 3/8	4	2.21
6	6 1/2	5 1/4	5 3/4	4 1/4	2.60
8	6 7/8	5 7/8	6 1/8	4 1/2	3.13
10	8 1/16	6 1/16	6 9/16	4 13/16	4.8
12	8 1/2	6 3/8	6 7/8	5 1/16	5.6
14	8 7/8	6 11/16	7 3/16	5 1/4	6.4
16	9 1/4	6 15/16	7 1/2	5 1/2	7.2
18	9 13/16	7 5/16	7 15/16	5 13/16	8.6
20	10 5/16	7 11/16	8 3/8	6 1/8	10
25	10 15/16	8 3/16	8 7/8	6 1/2	12
30	11 1/2	8 5/8	9 5/16	6 13/16	14
35	12	9	9 3/4	7 1/8	16
40	12 1/2	9 3/8	10 1/8	7 7/16	18
45	13 3/16	9 7/8	10 11/16	7 13/16	21
50	13 3/4	10 1/4	11 1/8	8 1/8	24
60	14 7/16	10 13/16	11 11/16	8 9/16	28
70	15 1/16	11 1/4	12 3/16	8 15/16	32
80	15 5/8	11 11/16	12 11/16	9 1/4	36
90	16 3/16	12 1/8	13 1/8	9 9/16	40
100	16 11/16	12 1/2	13 1/2	9 7/8	44
125	17 3/8	13	14 1/16	10 5/16	50
150	18 3/8	13 3/4	14 7/8	10 7/8	60
175	19 1/4	14 3/8	15 9/16	11 3/8	70
200	20	15	16 1/4	11 7/8	80
225	20 3/4	15 1/2	16 13/16	12 5/16	90
250	21 3/8	16	17 5/16	12 11/16	100
275	22	16 7/16	17 13/16	13	110
300	22 1/2	16 7/8	18 1/4	13 3/8	120
400	24 5/16	18 3/16	19 11/16	14 7/16	160

1 lb. water = .96 pints or 27.7 cubic inches.

NOTE: The Plumbago Crucible Association was organized July 15, 1919 and its activities along technical lines have thus far been confined mostly to the standardization of sizes. The officers of the Association are: H. A. Ross, President, Ross-Tacony Crucible Co., Philadelphia, Pa.; D. N. Clark, Vice-President, President, Naugatuck Valley Crucible Co., Shelton, Conn.

PLAN ESTABLISHMENT OF SCHOOL OF CERAMICS AT GEORGIA TECH[1]

Decision Reached at Atlanta Meeting of Georgia Producers of Clay Products Who Form Permanent Organization

A permanent organization of Georgia producers interested in the clay products industries in the state, was perfected at a called meeting held in Atlanta recently, and definite arrangements made for the establishment at the Georgia School of Technology, in Atlanta, of a school in ceramic engineering.

B. Mifflin Hood, president of the B. Mifflin Hood Brick company of Atlanta, was named general chairman of the permanent organization, and J. D. McCartney, of Savannah, Ga. secretary. The motto of the organization is "Educate Georgia Boys to Develop Georgia."

The various companies represented at the meeting donated a large part of the building materials and money that will be required for the construction of the school, among them being $1,500 worth of buliding materials by the B. Mifflin Hood Brick Company; $1,500 worth of laboratory equipment by the Central of Georgia Railroad, and $1,000 worth of equipment by the Atlanta Terra Cotta Company. Other contributions of a similar nature are expected from the affiliated industries throughout the state.

Another state-wide meeting is to be held at the Georgia School on May 29, at which time committees will be appointed for conducting a state-wide campaign for support of the proposed school, which, it is expected will be ready within a year.

Those in charge of the ceramic engineering school estimate that construction of the first unit, including laboratories, class-rooms, and so forth, will cost about $18,000 to $20,000, and that maintenance will be around $8,000 per year. It is proposed to build the school so that other units can be added later on.

The campaign to secure the needed funds is already under way, and Mr. Hood reports that he is meeting with such success that the project now has become an assured fact. He states too, that at a further meeting to be held May 22 in Atlanta the final arrangements and plans for the school are to be discussed, and that it will probably be known at that time just when work will be started.

A PROJECT WORTHY OF SUPPORT

The project to supply to science and industry a publication of physical and chemical constants is making very definite progress. The value of this undertaking cannot be over-emphasized. The missing data are so important, the uncertain data so much, that the effort to critically evaluate data already in existence and to encourage investigations and stimulate researches to provide new data is an undertaking that has immense possibilities to industry and science.

[1] *Evening Review*, East Liverpool, Ohio.

The publication will be known as "International Critical Tables of Numerical Data of Physics, Chemistry and Technology." Proposed by the American delegates at the meeting of the International Union of Pure and Applied Chemistry in London, 1919, this project was approved by the Union and the International Research Council and the responsibility of carrying it out assigned to America.

The editors are at work at the headquarters of the National Research Council, which has organized the project through a Board of Trustees and an Editorial Board. Dr. E. W. Washburn is chairman of the editorial board and editor-in-chief.

In the choice of the data to be secured careful consideration has been given by the editorial board to the needs of industrial and technical men as well as of the more academic research men. Effort has been made to learn the constants that are needed in industry, and arrangements are being made to try to provide these. Much information not hitherto published, but ascertained, wil lbe included. Specialists in both Europe and America have been enlisted.

It is necessary to underwrite this project, the National Research Council not having funds of its own for such a purpose. Industry is, therefore, being asked to provide the support. It is estimated that not less than $200,000 will be needed, and roughly $75,000 has already been raised or subscribed. The Board of Trustees is anxious to secure as soon as possible $125,000 still needed, so that there shall be no unnecessary delay in the publication of what is recognized as one of the most needed and valuable pieces of work for the benefit of science, industry, and the country at large.

RESEARCH FELLOWSHIPS IN CERAMICS

Engineering Experiment Station and U. S. Bureau of Mines at Ohio State University

During the past year two men have done their work for their doctorate at O. S. U. with the Bureau of Mines, Ceramic Experiment Station. Both investigations have been in the field of refractories. The arrangement has been so satisfactory to all parties concerned that three fellowships have been established for the ensuing school year whereby a man may spend his entire time with the Bureau doing the work on a problem agreed upon between the department in the College in which the fellow is doing his major work and the superintendent of the Bureau. The University is operating through the Engineering Experiment Station. The director of this Station has appointed a Committee consisting of the heads of the departments of ceramics, metallurgy and chemistry to choose appropriate problems and to select the incumbents. The fellowships carry a stipend of $750 a year.

CONTEST DATE ADVANCED

The closing date for the contest announced by the Vitreous Enameling Company of Cleveland to secure a *new idea* for an enameled product has been advanced to August 1. Correct information regarding this contest may be found in the advertisements in the June *Journal*, p. 3.

IMPORTANT MEETINGS OF AMERICAN CERAMIC SOCIETY

SUMMER MEETING—Toledo, Detroit and vicinity, August 8–9–10 and 11. A wide variety of plants to be visited. Pleasant excursions and entertainments. Detailed program will be mailed later.

FALL MEETING—National Exposition of Chemical Industries, week of September 17, New York City. Wednesday, September 19, is Ceramic day. The SOCIETY plans a profitable technical program.

CALENDAR OF CONVENTIONS

American Ceramic Society (Annual Meeting)—Atlantic City, Feb. 4, 5 and 6, 1924.
American Ceramic Society (Summer Meeting)—Toledo, Detroit and vicinity, August 8, 9, 10 and 11, 1923.
American Chemical Society (Fall Meeting)—Milwaukee, Wis., Sept. 10 to 14, 1923.
American Electrochemical Society (44th Meeting)—Dayton, Ohio, Sept. 27 to 29 (Dates Provisional).
American Electroplaters' Society—Providence, R. I., July 2–5.
American Face Brick Association—First Week in December.
American Face Brick Association (Southern Group)—West Baden, Ind., November.
American Gas Association—Atlantic City, Oct. 15 to 20.
Clay Products Association—Chicago, Ill., Third Tuesday each month.
Fire Underwriters' Association of the Northwest—Chicago, Ill., Oct. 17–18.
National Exposition of Chemical Industries (Ninth)—New York, Sept. 17–22.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BULLETIN
of the
American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

Vol. 2 — August, 1923 — No. 8

EDITORIALS

CERAMIC SCHOOL CURRICULA

In the days when all shops were of small production there was no felt need for school trained men. The man who had sufficient imagination and creative ability to make a salable product had naturally the ability to find and to use the knowledge then available. The technical problems were handled sufficiently well by men schooled by experience.

Time was (and to many it still is) when skill of the "experts" was thought to consist more of knowledge of materials and mixtures than of creative and managerial ability. As a matter of fact formulas have been available for several decades to all who would read or who would purchase. Ceramic mixtures have been of value only to those who possessed vision and the creative genius of translating formulas into serviceable products. There can be no discounting the ability and economic value of the experience taught experts. Their worth can be fairly judged by the quality of wares they produce. It is the change in manufacturing conditions and the rapidly increasing quality demand that has made it necessary that the training of "experts" includes a thorough and broad searching of the fundamental sciences as applied to ceramics.

The "experts" needed by the manufacturers of refractories are those able to analyze the service conditions which the refractories must meet. These service conditions are increasing in variety and severity. New

products involving new methods of production are needed. The expert must explore the material resources and devise methods of manufacturing.

Such is the task of the "expert" in the production of any ceramic ware; glass, spark plugs, porcelain insulators, chemical wares, sewer pipe, hollow building tile, architectural products or enameled wares.

An Ideal Course of Training

How can a college best train men for service in the ceramic industries? Of what should the curriculum comprise? These questions are being asked alike by the instructors and by the employers. The instructors are anxious to prepare their pupils for the most efficient service and the employers wish to learn how best to use the pupils.

It is taken for granted that the collegiate course will include training in the fundamental sciences and in such cultural studies as will equip the pupil to creditably discharge his social and civil obligations. These are essential foundations for special ceramic training.

1. Ceramic Products

Rather than general lectures and laboratory exercises on porcelain compositions it would seem more beneficial to approach the study of porcelains from the service which porcelains must give. This would call for an analysis of the essential properties of porcelain products and the influence of constitution, structure, dimensions and shape on these properties. Porcelain now on the market could be tested and the conditions of use studied.

Such a study of ceramic products could be made on specimens of known compositions, designs and methods of manufacture. Most manufacturers would gladly coöperate with the colleges by making the test pieces and giving information regarding the essential properties. Both users and producers would collaborate with the colleges in devising means of testing.

The teaching of ceramic technology on this sort of program would necessitate a stock of test pieces that would be more than a museum of specimens. It would require access to quite a variety of testing apparatus but probably very few not to be found in University laboratories.

2. Ceramic Processes

Collegiate schools cannot furnish opportunity for practice in forming wares. A general knowledge of processes can be had by week end shop inspections or by scheduled plant visits.

There are some decorating processes which could be demonstrated and with which the pupils should obtain personal experience. Such demonstrations could be in the nature of laboratory work at the school or in a plant.

There are experiments in processes that could with profit be given, such as the use of electrolytes in casting slips and in plastic mixtures of

all sorts. These also could be in the nature of laboratory or plant demonstrations.

3. Ceramic Engineering

Every ceramic student should have a thorough course in drafting and designing including chemistry and thermo-dynamics of fuel burning and power production. It is important that the ceramist shall know how to conceive and to put his conceptions into working drawings.

4. Process Control

Control of manufacturing processes by analysis of materials and products, (measurements of temperature, drafts and pressures and of volume changes, etc.) will be the largest task of ceramic graduates. Compounding of mixtures and experimenting with new materials will continue for all time in any factory but the greater responsibilities will be in the instituting and continuing of factory control devices and methods. The larger the plant or the more exacting the specifications of product the more important is process control.

Pyrometry and other physical and chemical measurements would constitute a course in this ideal curriculum. Familiarity with precision methods and apparati is quite essential.

5. Promotion and Development of Products

If a graduate has not the ability to vision new uses, new products, new color or structural effects he will be doomed to routine services. This same appreciation of promotion and development applied to factory management is essential in large plant production. Lectures on promotion and development of products and human engineering is a cultural course which every industrial worker should take.

Summary

The ideal curriculum then would not stress compounding of ceramic materials. It would stress the essentials in process control and the production of wares to meet specific requirements.

It would develop the inventive ability of the pupils and give familiarity with precision methods and instruments. Rather than emphasize routine empirical mixing without vision of the exact requirements of the ware to be produced it would stress the reasons for the materials, mixtures and processes used. It approaches ceramic problems with the knowledge of what is wanted and a question of how to produce it. In this it differs from much of the present day school exercises of making a series of type mixtures with no other aim than to familiarize the students with the several types without more than inference to their possible industrial use.

Ceramic industries are today in need of experts who can produce wares that will meet exacting specifications. The colleges should be training their pupils to meet this need.

GREETINGS FROM PRESIDENT GREAVES-WALKER

The SOCIETY now has 2053 members on its roster.

It publishes a 170 page *Journal* each month.

The July *Journal* contained 95 pages original researches, 29 pages of abstracts and 47 pages of discussions and notes.

The SOCIETY has published 19 volumes of annual transactions and is now issuing Volume 6 of the *Journal.*

1278 pages of valuable material has been published this year including the July *Journal.*

The SOCIETY translated the Collected Writings of H. A. Seger and is now engaged in translating a new book by Dr. Singer.

The SOCIETY has published two bibliographies, has two in press and one in preparation.

It initiated and campaigned to successful issue the forming of Ceramic stations in the Federal Bureaus.

It assisted in the instituting and organizing of four collegiate ceramic departments.

The SOCIETY holds an annual convention in February for the presentation and discussion of papers, a "Summer Meeting" in August for plant visits, and a "Fall Meeting" in connection with the National Exposition of Chemical Industries for educational promotion.

The SOCIETY has seven Industrial Divisions; Art, Enamel, Glass, Heavy Clay Products, Refractories, Terra Cotta and White Wares. These Divisions have their own officers, committees and rules. They are self-governing and have a representation on the Board of Trustees.

The SOCIETY has seven Local Sections, the eighth one now under petition. These likewise are self-governing.

This scheme of organization is an effective decentralization of activities through centralized assistance and coördination making possible unit coöperation with all other industrial and educational groups.

This is your SOCIETY, your opportunity and your duty to yourself and to the profession of your adoption. The ceramic industries will benefit from your continued and aggressive support, but yourself will be the more greatly benefited in proportion to the extent you actively serve in the affairs of the SOCIETY.

We should have many more than 2000 members. Our net increase this year is 19 less than it was last year at this t me.

The larger the membership support the larger will be the returns to each member.

We should have more corporation members.

Will you not present the SOCIETY's past achievements and the present program of service to those who are not now members? Do this and your own returns will be greater.

PAPERS AND DISCUSSIONS

TRAINING OF ARTISTS FOR THE INDUSTRY

By J. Bailey Ellis

The College of Fine Arts is one of the subdivisions of the Carnegie Institute of Technology, which in turn is connected with Carnegie Institute and Museum. In the College of Fine Arts are housed six departments. We have as the oldest department the Department of Architecture; then we have a Department of Painting and Illustration, the Department of Music, Department of Drama, and the Department of Sculpture. The youngest department is the one I am especially interested in, which is called the Department of Applied Art. In this department we have a curricula which requires a general pursuit of certain courses for the first two years.

While each department is primarily interested in training its students for some specific field in the fine arts, the students are required during the four years they are with us to pursue certain courses in general studies as we call them, so that after the successful completion of any one of the curricula that student is eligible for a Bachelor of Arts degree. We give the required amount of English (two years of college English), two years of a modern language, history of civilization and general history of the arts, the history of costume, history of furniture, all strong history courses. We place these several courses into the curricula without interfering with the main part of the day in which the students can do their best work in the technical field. Most of these general studies come either in the early morning periods or the late afternoon.

In the Department of Applied Art, we require all of our students to follow a general curriculum for their first two years, because we believe that no matter in what field a student is eventually going to apply his art training, a certain foundation program and knowledge is necessary. Elementary design applies as much to some student who is going to function as a potter as it does to some one going in for costume designing or interior decoration. We think all of our students should acquire a certain ability to draw, to reproduce what is set up before them, therefore, this foundation training in the first two years.

Then, according to the way they develop, to the bent they show after going through these several courses, according to the thing they seem to feel they want to pursue, which very often is a complete change from the call that they had in mind when they first came to us, they may elect to specialize for their junior and senior years any one of five options. In each of these options it is possible for a student to make even a closer specialization.

First of all, there is a crafts option or craft specialization, and in that option we have pottery, jewelry and metal working, block printing and weaving.

A second option is given for costume design and illustration, where we are training students to design wearable costumes and makeable costumes.

We have an option in normal art, for the training of teachers to function in the public school systems or colleges throughout the United States.

There is another option in advertising and printing design, where our aim is to turn out a student who shall function, not as an illustrator, but as one who can illustrate, who knows something of color, of inks, of paper stuff, of type faces, who has had certain experience in type setting, in the processes of press work and reproduction. That student should be in position to take charge of the art end of an advertising establishment, or to be an art advertising man for a large printing concern. It is becoming more and more an accomplished fact that large print shops with a reputation are finding it well worth their while to go into the field of a complete job from the layout, the copy-writing through to the finished work.

Another option which we call Industrial Arts Design includes interior decoration, specialized furniture design, stained glass and wall paper design.

We have certain advantages at Carnegie Institute of Technology that no art school in the country has in equal proportion. The College of Fine Arts is one of four colleges, and in addition to the four colleges we have a division of general studies which takes charge of the faculties teaching the history, English and the languages courses, etc.

There are also a number of bureaus, coöperating with different concerns, making close contacts with business concerns and manufacturers outside of the College.

It is possible for the Department of Applied Art to so develop the curricula that a student who is specializing with us in costume designing can be sent over to the Margaret Morrison College to the department of costume economics for certain courses in draping, in dressmaking and pattern crafting. Students, therefore, who are not going to become dressmakers or costume economists primarily but who go into the costume fields, will have the opportunity of getting first hand information and experience in the technical and material limitations for which they are to design. It is also possible for any students following the advertising option to go into the department of printing in the College of Industries and have certain intimate experience with types and inks, because the department of printing has quite a complete shop within itself. And so on through the various options. By having departments in other colleges which are training students for certain fields in which art has a specific and legitimate use, our program offers close contact with the actual mechanical experiences, so that students can get a certain amount of that direct information neces-

sary to turn out a designer who can successfully design for the particular purpose or trade in which he is interested.

This is the thing we shall have to develop more and more in this country. There are a large number of schools turning out students, who after they have left school must gain the experience necessary to make what they have to contribute of value to the person or to the company in a position to give them a job that will bring in a certain amount of return. Anyone who is interested in the fine arts end of ceramics, necessarily a broader field than just pottery, will be interested in the organization which we have effected at Schenley Park. We have not been in a position to do very much advertising; we do not run our courses as a moneymaking proposition and, therefore, although we have grown very rapidly, we are not so well known outside of Pittsburgh and Western Pennsylvania as we would like to be, and as I think we deserve to be.

C. Dressler:—I should like to ask Mr. Ellis whether he is training people especially for the architectural work in connection with the fine art work, the subject which was last discussed?

J. B. Ellis:—One of the departments, the architectural department, in its curriculum, has a certain amount of architectural modeling, and also includes students going into the Department of Sculpture and working out certain problems in clay. When we have sufficient faculty available, we shall be able to enlarge that work, so that they cannot only model the clay but do it with the idea that if the thing works out successfully, it can be fired and glazed.

W. D. Gates:—In Chicago there is now formed the Society of Arts and Industries, and they are planning the erection of quite a large addition to the museum and have it run under the Art Institute, for training in different lines in connection with the industries, and training young men and young women in the line of all these different industries. Considerable progress has already been made toward the fund for putting up this building.

A NOTE ON THE REQUIREMENTS OF SAGGER BODIES

By M. F. Beecher

In discussing the possible improvements in the quality of saggers it seems well to inquire first into the common causes for failure, and then to consider how and to what extent those causes may be eliminated. In making such an inquiry it would be advisable to separate those due to the character of the raw material from those due to the process of manufacture, to allow more careful study of each factor. This note will present some comments pertaining to the raw materials.

The materials of which a sagger is made are probably deserving of first

attention. In the past, clay has been almost universally used, but of late years newer and more refractory materials have been receiving study by manufacturers. And it should be had in mind that perhaps some of these new materials have properties other than simply greater refractoriness that might particularly commend them for sagger use. (By refractoriness is here meant, ability to remain rigid under normal load, under the influence of heat).

The first requirement of a good sagger is that it remain rigid at furnace temperatures (refractoriness). Lack of rigidity may be evidenced by softening (chemical failure) or by rupture in shear, tension or compression (mechanical failure). Chemical failure is due essentially to the character of the constituent materials resulting in low fusibility. Mechanical failure may be due to an insufficient amount of the bonding constituent, to volume changes taking place during use because of changes in crystalline structure, to diffusion of slags or to other causes. Since mechanical failures may readily arise from chemical changes within, or reaction between the constituent materials, no sharp line of demarcation can be drawn.

The other principal requirement is that it have good mechanical strength at room temperature, both originally and after continued service. Original high mechanical strength can be easily obtained, by the use of a strong bond in sufficient amount. The retention of that strength with continued use is a function of the material used and is the principal unsolved problem in this connection. In fact this is the really big problem in connection with sagger materials and mixtures. The means are at hand whereby selection of materials of suitable refractoriness may be made, and sufficient data are available to serve as a guide in their proper proportioning so that saggers originally strong at room temperature and mechanically rigid in the furnace can readily be made. Present practice readily demonstrates this. Service tests almost invariably disclose that every piece remains intact during the first three or four burns and then losses by breakage begin and continue at a more or less rapid rate. This means that the saggers were originally strong at room temperature and were chemically and mechanically rigid in the kiln, but after a few firings begin to weaken so that they are cracked or broken when drawn from the kiln or fall apart in ordinary handling.

The factors or properties which seem to be most involved in this deterioration are coefficient of expansion, modulus of elasticity, thermal conductivity and mechanical strength.

If sagger bodies did not expand and contract when heated and cooled the sagger problem would be a simple one. The expansion and contraction is in no case uniform throughout the piece for in no case is the sagger heated uniformly. Other conditions being equal then, that body which has the highest thermal conductivity will be under the least internal stress because

the temperature differential will be smallest. Also that body having the lowest coefficient of expansion will have the least internal stress because it will be under the smallest internal strain. Again, that body having the lowest modulus of elasticity will be under the smallest internal stress, for other things being equal, a given temperature differential would produce a given amount of strain. Obviously, that body having the highest mechanical strength in the kiln will remain unbroken the longest, when subjected repeatedly to this differential expansion and contraction.

The mechanical effect of this differential expansion and contraction is to produce fine cracks throughout the structure. These partially relieve the strain produced, but result obviously in a mechanical weakening of the piece. Since the mechanical strength decreases with the development of these cracks, the deterioration from this cause will continue from burn to burn. It is apparent then that the best sagger body is that one which develops these fine cracks at the slowest rate and that will be the body which has high thermal conductivity, low coefficient of expansion, low modulus of elasticity and high mechanical strength.

Before very substantial progress can be made, more data of this character on the available refractory materials are necessary. Silicon carbide and fused alumina have given indication of long life as saggers. The coefficient of thermal conductivity is high, being about 10 and 5 times respectively that of fire clay. Their moduli of rupture are high also in comparison and their coefficient of thermal expansion somewhat lower. Data on modulus of elasticity are lacking but they probably have no advantage over clay in this particular.

With a more careful study of these four properties of available sagger materials it is safe to say that much more durable and economical saggers can be produced than have ever been made before.

Norton Company
Worcester, Mass.

SAGGER COLLOQUIUM[1]

Led by W. A. Hull

W. A. Hull:—Mr. Pence, as Chairman of this Division, has in mind a program of coöperative research on sagger problems.

F. K. Pence:—Any attempt on my part to offer data at this time is premature. The Bureau of Standards is conducting an investigation on this subject in coöperation with certain manufacturers, particularly those of the U. S. Potters Association, but these investigations are not far enough along to give data.

The sagger problem naturally divides into two phases: the first being the behavior of the sagger in the raw state, and the second, the behavior

[1] Whitewares Division, Pittsburgh, Pa., February, 1923.

in use. In order that we may have a workable body in the raw state, the materials must possess satisfactory strength and drying properties. For this, modulus of rupture tests are being made on standard bars. In spite of the fact that considerable work has been done, we have failed to determine exactly what properties are required in the clays for saggers. The outlining of investigations to determine these properties is, in part, the task of the Research Committee of the Whitewares Division. I shall state very briefly the line of attack we have in mind.

All other considerations aside, we should probably select those clays which have the greatest strength in raw state. To determine this strength a standard test bar 6 inches long and one square inch cross-section is made and tested when dried. In the forming of these test bars care is taken that there are no laminations, cracks or molding faults. It may be formed by rolling in the hands, placed firmly into a brass mold having a movable bottom, the surplus clay cut off with a fine wire and the bar then removed carefully and air-dried for three or four days; and finally dried at 105° to 110°C. It is then placed in a dessicator and tested moisture free.

The other observations on the raw clay are (1) drying shrinkage and (2) the sticky quality.

A close sticky clay may dry with great difficulty no matter what the shrinkage. Black sticky clays are of that nature. A clay with low drying shrinkage is desired. Usually the clay of greatest strength has the greatest drying shrinkage.

Having the modulus of rupture in the raw state the next test is the fire shrinkage. This shrinkage is important.

The sagger should be of the highest mechanical strength when fired to withstand the breaking strains in handling and the load strains in use. Frequently high mechanical strength is obtained only at the expense of ability to withstand rapid temperature changes. As a rule the more porous saggers will best withstand temperature changes, hence it is that for some purposes either strength or porosity must be sacrificed and in all cases a workable balance obtained. We cannot have maximum strength with maximum resistance to breaking due to sudden temperature changes.

The general ware industries have found that an absorption of 14% to 15% was most satisfactory. This would not be suitable for all industries. It was determined that 14% or 15% absorption gives a body fairly open and yet of sufficient mechanical strength.

The Bureau of Standards will make porosity and strength tests. Such data should be correlated with modulus of rupture on standard bars made of the clays.

We want to be able to say that a sagger for a given purpose must have a certain mechanical strength and that if a sagger in question does not have this strength the chances are that it will not serve.

The control of firing shrinkage by the amount of grog and the resultant effect on strength is important. What is the effect of 40% grog as against 50%? We must use grog and yet we cannot overload the bond clay with it. Forty per cent or more grog is quite usual for general ware. At first I was of the belief that this was too much grog. When more grog is used than the bond clay can carry the saggers will not stand up; they will settle under load. This could not be allowed in the case of pin saggers for the alignment of the pin holes must be maintained.

Is the size or the range in size of the grog of importance? Can we use coarser grog in case we use less?

It may be difficult to lay down absolutely a rule for any of the white wares industries, but for given conditions of load and heat treatment *I am sure* that rather definite and useful data can be obtained.

We shall work out a questionnaire in the Bureau of Standards regarding the working properties of clays in the raw state including such properties as strength, drying shrinkage and the amount of grog that each can carry, the mechanical strength fired as determined by modulus of rupture on standard bars, the effect of repeated heat treatment as perhaps indicated by firing test bars repeatedly and testing, and resistance to sudden change of temperatures.

Recently I saw a rig to determine the resistance of spark plugs to sudden temperature changes. They revolved the carrier over a flame thus subjecting the plugs to alternate high and low temperatures. The number of revolutions were recorded and from this the number of alternate heating and cooling which each plug sustained before cracking was known. Some such tests would give valuable data on saggers.

The Bureau of Standards is in a position to determine the properties of sagger clays at different firing temperatures. They have such data for ball clays. A study of the vitrification range of sagger clays is important as was shown in Purdy's original work in Illinois on paving brick clays.[1]

The object of this colloquium is to obtain the largest possible coöperation in investigation of saggers and sagger materials.

W. A. HULL:—There is no question but that Mr. Pence is an optimist as to what we are going to do this year, but there are some of the potters who are already doing parts of this work which Mr. Pence has suggested. Some of the potters are testing their own clays. Some may be doing work on the properties of sagger mixtures, and perhaps making tests that Mr. Pence has suggested. The Bureau of Standards would be glad to get in touch and compare notes with as many of such laboratories as care to do this.

In work of this sort, a certain amount of effort will be lost, not so much

[1] R. C. Purdy "Paving Brick and Paving Brick Clays of Illinois," *Bull.* **9**, Ill. State Geol. Surv. (1908).

due to overlapping as to the fact that one investigator will run against snags that perhaps some other investigator has already found a way around. If a number of factory laboratories will do such work as they can along lines that Mr. Pence has suggested and such other lines that may suggest themselves, and will pool results through the Bureau, all who thus participate will profit. We have given publicity to the fact that we are working on these problems and have sent out for material. Some offices have a follow-up system apparently and want to know soon if there are any results. The more laboratories working on this subject the fewer inquiries we are going to have to answer at the Bureau of Standards. The term "Bureau of Standards" is used as an all-comprehensive term which indicates an enormous capacity for work. When we started on this sagger investigation we looked for a year and a half before we found one man suitable to put on it. Now we hope to have funds enough to give that one man some assistance.

As Mr. Pence has already stated, there are two things we have to consider. (1) The properties of the materials that go into the saggers (2) the properties of the finished saggers. The refractories people are charting the conditions to be met by refractories in use. By thus listing the properties required they will determine the suitability of refractories for specific purposes. If the properties needed in a sagger are known, we then have an intelligent basis on which to search for the required materials with which to fabricate and the method of fabricating to get the best results.

A. V. Bleininger:—Messrs. Pence and Hull have already covered the subject of tests so thoroughly and comprehensively that there is very little to add. I shall refer, however, to the mode of preparation. I have always been impressed by the fact that if a man was instructed to devise the very poorest method of mixing and preparing a sagger mix, he would probably hit upon the way in which most potters are doing it. The old time-honored soakpit and the system under which it is operated, the method of incorporating the grog, the method of operating the pug mill, which is easily the worst piece of apparatus on the plant, all contribute to the fact that the resulting product is bound to be of uncertain quality. Frequently I wander through a sagger shop and examine the prepared material ready for use and note the lack of homogeneity in the sagger body.

I believe that making of good saggers is intimately associated with proper preparation. This, we all agree is a thing in which we must bring about a profound change if we are to get better results. This is one thought we must keep in mind.

We must realize also that the laboratory tests involve methods of preparation which are very much better than those in actual use and hence the results must be judged accordingly.

I should like to second the Chairman's suggestion that we study the resistance of sagger bodies to thermal shock. The Refractories Committee of the American Society for Testing Materials has already attacked this problem.

One other suggestion is that we determine the after-shrinkage of the prepared sagger body subsequent to the first firing. This is a very important fact, because if you have a sagger body which contracts in use under load imposed on it, it is evident that you are subjecting the sagger to a very heavy stress. Hence it is important that the after-shrinkage be reduced to the minimum. I believe we have here the keynote of a vital point not heretofore considered.

It is not so much the initial shrinkage we desire to know but the after-shrinkage in the second, third, fourth and fifth fires. This should be followed up with considerable care.

H. Goodwin:—We all realize that saggers are an important problem and that they will be important as long as we are in the business. At St. Louis last year we had this under discussion[1] and it was agreed that certain lines should be followed. I am somewhat disappointed that we do not have further data to be presented at this meeting. I fully realize and agree with all that has been said. We are working in the dark with the sagger problem. It is just as necessary for the sagger mixture to be right as the body. Can anyone tell results obtained last year at St. Louis, when a motion was made that the Society take up the matter with the United States Potters Association and the Bureau of Standards.

A. V. Bleininger:—This matter was not neglected. It was taken up and duly presented to the U. S. Potters Association and they have responded to this and to other suggestions by appointing a research committee. Your Chairman is a member of that Committee. The proposed sagger investigation was discussed quite fully and we came to the conclusion that we must first secure all of the preliminary information possible. Before making an appropriation of the magnitude mentioned, preliminary studies are needed.

There is available a rather large amount of information which should be gathered together before much money is spent. The U. S. Potters Association is making a study of this field and will be ready to coöperate with this Society as soon as the situation has been clarified. There are a number of aspects of this important problem that must be considered carefully.

W. A. Hull:—Has anybody any standards on the strengths or moduli of rupture of sagger mixtures? Someone may have determined this from his own experience. Mr. Bleininger, how strong should the three types be?

[1] See C. C. Treischel, "Coöperative Research on Sagger Mixtures and Manufacture" and Discussion, *Bull. Amer. Ceram. Soc.*, **1** [7], 101–6(1922).

A. V. Bleininger:—I could only make a guess, but we can give you definite information along these lines from our records. We should be glad to give you the figures we have obtained at our plant and Mr. Pence would do likewise. In addition, Mr. Pence has conducted for our Research Committee a series of tests which he will report in the near future. I think I can speak for most of the pottery companies that they would be glad to assist in every way.

W. A. Hull:—We do not want to write to all the pottery companies and ask them individually, but I assure you they would be welcome.

A. V. Bleininger:—The Research Committee of the U. S. Potters Association will be glad to furnish all the information it can.

W. A. Hull:—That is the proper channel. As already more or less advertised, the Bureau is undertaking to do some work along the lines of the sagger problems but we cannot do much more than make a beginning in a year. We have requested manufacturers to send in samples of the clays they are using. The plan was to make a survey of the properties of the important types of sagger clays now in use as a basis from which to plan a systematic investigation, very much along the lines which Mr. Pence has indicated. We have determined some of the properties of fifty-five clays. Those will undoubtedly resolve themselves into groups of clays with similar properties. Then we propose to make mixtures in the laboratory duplicating as nearly as possible some of the successful mixtures that are in use so that we can obtain data on measurable properties of these factory-tried mixtures, thus having a basis for comparing laboratory saggers with factory-made saggers.

We then propose to make some mixtures of our typical clays and compare their properties with those of mixtures in use.

As means of studying the progressive changes that go on in successive burns that the sagger goes through, we are going to ask some of the potteries to fire test bars made in the Bureau of Standards under conditions that admit the least effect of the personal factor in the preparation of the specimens. From each successive firing, test bars of each sagger mix will be sent back to the laboratory to be examined and tested. We can thus find what develops from the repeated firings. I do not think there is any question in anybody's mind but what the sagger deteriorates in some way due to its repeated heating and cooling. We believe that the kind of deterioration, the nature of the change and the extent of it, depends on the nature of the mix and in the kind of firing to which it is subjected.

What investigations have been made have been for the most part with a view to getting results rather than getting explanations and the Bureau of Standards particularly should be able to go a step further.

It is readily understood that the undertaking of this investigation be-

ginning with the clays themselves and following with different mixtures of clay and grog is a big job. I wish to speak for the investigators your coöperation and your patience.

M. R. Hornung:—The biscuit sagger carries a heavier load than that on the bottom whereas the glost sagger carries a lighter load oftentimes on pins projecting from the sides of the saggers. The glost sagger which carries only a few pieces of hollow ware on the bottom certainly ought to require a different sort of sagger than that for the biscuit.

We have made saggers out of fine grog and it is surprising how they have lasted. But it is hard to dry them. They must be thoroughly dried before firing.

The machine-made saggers differ from the hand-made. For equal service results, the properties of the saggers by these two methods differ a great deal.

G. E. Sladek:—We use a 50% grog body for our machine saggers and we seem to have fair luck with them. We have had our share of friable saggers, and we also have a little trouble with glost saggers.

When we first started to fire coal in our periodic kilns, the wads stuck. This difficulty was eliminated by a slight change in the design of our fire box, by which oxidizing conditions were obtained. This seemed to have a marked effect on the life of the saggers. We have had very good luck, however, for three years.

Another point is that we keep account of the number of saggers broken in handling and the number coming out of the kiln broken. The average is three broken on drawing for one broken in the handling.

W. A. Hull:—Does anyone want to contribute from his experience in the casting of saggers?

A. V. Bleininger:—Some cast saggers were made at our East End Pottery. There is promise of improved quality but from the standpoint of cost our experience so far is not promising. Our general superintendent, Mr. Walker, has studied the subject but what information he has obtained indicates that the process would be more expensive. Also the question of room was a serious one, where all the space is taken up already by manufacturing processes. Some work in this connection has been done by the Mount Clemens Pottery Company. Similar work has also been done by Mr. Brain of the Standard Sanitary Manufacturing Company. They have had good success with the cast saggers.

The casting itself is promising from the standpoint of quality but there are other questions coming in. If you begin to figure on the number of molds required I think you would get rather astonishing figures.

H. Goodwin:—The question of kind and percentage of grog has been brought up. Frequently factories run short of biscuit grog and have to resort to broken glost saggers. A successful manufacturer told me that

he calcined sagger clay, so much of it in each kiln to maintain the quality of his grog. I have found that very successful. The use of glost saggers for grog will bring trouble. The size and quality of grog must be under control if we are to make saggers of the greatest mechanical strength.

T. A. KLINEFELTER:—We have not been casting saggers long enough, nor in sufficient quantities to get well-analyzed or the lowest costs, but at present they are costing between two to four times the ordinary saggers. While I cannot give definite data on the life of cast saggers there is a general understanding that they are lasting twice as long.

Cast saggers come straighter and you can pick them out from the rest. I attribute the straightness to the more thorough mixture. There have been papers read in the Terra Cotta Section about making tile, which is exactly the same proposition, in which was brought out the fact that good mixing and proper pressing was often more effective in producing good quality tile than was the selection of clay.

F. K. PENCE:—At Zanesville we came practically to the same conclusion. The cast sagger was very satisfactory but with proper mixing the plastic sagger was made nearly as good.

A MEMBER:—In New England they still use the old wheel chaser. At one time they thought that method was antique. They installed a wet pan but it failed completely. They then went back to the wheel chaser. This is an old-fashioned device; a big cart wheel on a ratchet that causes the wheel to travel from the center to the outside of the pan. The clay and grog is soaked overnight. This procedure gives a very homogeneous product.

H. GOODWIN:—If I can be of any service to Mr. Hull, and he wants anything from me, I shall be glad to send it to him.

A. S. WATTS:—The following data is taken from a thesis by D. M. McCann.

Ingredients	
No. 5 Fire Clay (Lower Kittaning)	Fuses Cone 32–33
X Wad Clay (Tennessee)	Fuses Cone 28
Ball Clay (Hazel, Ky.)	Fuses Cone 31
Grog (4- to 16-mesh)	Fuses Cone 31

Clays ground to pass 20-mesh sieve.

All mixtures soaked 24 hours, put through pug mill 3 times, then soaked 24 hours and pressed in steel die. The trial pieces were solid cylinders 6 inches long and 7 square inches across sectional area. They were fired to cone 2 and then sent to the Mosaic Tile Company, Zanesville, Ohio, where they were fired at cone 10. One third of each set was fired at cone 10, once, another third was fired at cone 10 five times and the third set was fired at cone 10 ten times.

The best body had a composition of 20% ball, 7½% wad and 22½% first class fire clay, 50% grog. The second best had a composition 27½% sagger ball clay, 22½% fire clay, and 50% grog. The general conclusions found from this study were that ball clay weakens in excess of 25% while the fire clay and wad clay have about the same

strength. Additional fire clay increases the strength up to 22½% when mixed with ball clay. There is a slightly increased strength with the addition of wad clay. We found better saggers with the fire clay, ball clay and wad clay mixture than with ball clay and wad clay or ball clay and fire clay. The values vary from 300 pounds to the square inch to 1100 pounds to the square inch. Some manufacturers have sagger mixtures very similar to No. 7.

	Composition				Crushing Strength of Trial		
No.	Ball	Wad	Sagger	Grog	Load test 1 burn lbs.	1330°C 5 burns lbs.	10 burns lbs.
1	20	30	..	50	7000	6200	6100
2	20	22.5	7.5	50	6666	6500	6320
3	27.5	22.5	..	50	3930	3950	3920
4	20	15	15	50	6950	6950	6860
5	27.5	15	7.5	50	7400	6265	6100
6	35	15	..	50	6450	5100	5000
7	20	7.5	22.5	50	8000	7500	7000
8	27.5	7.5	15.0	50	4300	4100	3720
9	35	7.5	7.5	50	7000	6830	6450
10	42.5	7.5	..	50	1950	1620	1820
11	20	..	30	50	4550	1580	4550
12	27.5	..	22.5	50	8000	7500	6400
13	35	..	15	50	5500	3200	3100
14	42.5	..	7.5	50	1900	2050	1680
15	50	..	..	50	2020	2000	2000

H. Goodwin:—Years ago I made several tests using New Jersey clays with 20% fire clay, with good results, although fire clay is not extensively used. Prof. Watts' report bears out my experience.

W. A. Hull:—Is that not more generally done because fire clays are not used in potteries?

H. Goodwin:—Most factories keep a small stock of fire clay for the repairing of kilns. We always keep it on hand and I do not know why we have not used it more extensively. During the years 1920 and 1921 we had about 6% fire clay in our sagger mix.

W. A. Hull:—Is the strength of the dried mixture an index of the strength of the burned mixture and is there any relation between the two? Has anybody ever tried a sagger mixture more refractory than necessary and burned at a higher temperature? Has anybody tried burning saggers the same as for refractories?

H. Wilson:—Our experience might be strange to some here. I found we could increase the life of saggers 50% by reducing the first heat. We first fire at a lower temperature thus, we believe, adding to the life of the sagger. That is contrary to Mr. Bleininger's experience.

W. A. Hull:—Where do you burn them?

H. Wilson:—We burn a kiln of saggers at about cone 8, while cone 12 is the heat in which they are used.

H. Goodwin:—Relative to the life of a sagger first fired at a lower

temperature my experience has been that such saggers when used in glost kilns give considerable trouble due to new saggers being larger. No matter how carefully the wad has been put on it will shrink away leaving a fissure from $^1/_8$ to $^1/_4$ inch. There is also the added danger of the bungs collapsing due not only to the saggers being of different sizes, but to the fact that the new saggers burned at a lower temperature cannot carry the weight of a bung of loaded saggers. It may be all right with you, yet it is a dangerous practice.

W. J. THROWER:—I will have to agree with Mr. Wilson with regard to the firing of green saggers to a heat below that at which they are used. For a period of 18 months we have been firing our green saggers at about cone 5 or less. This materially increases the life of saggers.

That idea was given to me by a very old kiln fireman. He could not present an argument to justify it. He knew it. We tried it and have never quit it. From our experience I will agree it works satisfactorily.

There is no question but that one of the greatest things today in the making of saggers is the preparation of the clay. During the war everybody let down on quality. The men would put the clay into our soaking pits 15 inches thick. They would put the allowance of grog on that and then 14 inches more of clay. There was a loss of about 50% in the saggers. We then made each layer only 6 inches thick. Any clay in lumps had to be broken up or partly pulverized. On that 6 inches of clay was put its quota of grog. Thus the pit was built up until we got eight layers instead of three. Instead of having a 50% loss, it ran around 8 or 9%. There was no change in sagger clay. It is a question of the proper mixing of clay. I should like to ask Mr. Bleininger if he used the same mix as is generally used.

A. V. BLEININGER:—I think the regular mixture was used except it may have been somewhat finer grog.

W. J. THROWER:—We should devise some means of crushing so we can mix the clays before putting them into the pit, if we still use the pit.

H. SPURRIER:—Two points occur to me. The amount of water used in tempering the mix is a matter of importance and the drying also is another point of considerable importance. If you conceive of a sagger mix as merely a body cemented together, your grog does not lack in size or shape, whereas your clays do and you have to consider that you have a body cemented together. It is delicate.

Some have maintained that if saggers were dried in a drier the life would be increased. I have never seen saggers dried with such care but I am quite ready to believe it would add to the life of the sagger. Moreover I do believe the saggers are handled far too roughly. They are delicate prior to the firing.

A. S. WATTS:—A client of mine used four kinds of sagger. These,

previously finely crushed, were shoveled with 4- to 16-mesh grog into a brick machine equipped with a nozzle that gave a 6-inch square column of stiff mud consistency. The grogged mix thus pugged was piled and allowed to age for three weeks covered with wet burlap. Saggers were made by the ordinary hand pressing.

They thought it was not necessary to crush the material so fine, so after the first batch of 160 saggers, they made another lot with coarser clay and pan run of grog. Saggers thus made failed whereas the manager said the first lot of saggers lasted until they were "ashamed of them."

F. CERMAK:—We have mixed clay for 8 years at the General Electric Company in an 8-foot pan. We make a batch of 600 pounds which runs from 8 to 10 minutes. We do not use a soak pit.

A. S. WATTS:—About firing saggers: the most severe treatment green saggers receive is in the original burning. In a stack of green saggers, twelve high, the one on the bottom is drying and firing under an enormous load. Then we wonder why they do not come out strong. The saggers burned on the top of the kiln, two or three on a bung are the best. If, when it is necessary to boost the production of the saggers, the green saggers are stacked five or six high the result is inferior saggers. They are unduly strained.

W. A. HULL:—We started out with a misconception of the situation, stating sagger troubles, and it looks as though all we have to do is to make saggers the best we know how. Nobody appears to be doing it. What is the use of an investigation if we know about it all the time and let our bad practices go on?

The problems of proper choice of materials, their compounding and burning are being investigated by the Bureau of Standards. The Research Committee of the U. S. Potters Association is collaborating and it is the purpose of the Research Committee of the White Wares Division of this AMERICAN CERAMIC SOCIETY to participate in this work.

SERVICE CLASSIFICATION OF FIRE BRICK

Committee C-8 on Refractories of the American Society for Testing of Materials has adopted a scheme looking toward a service classification for refractories. At the present there is a classification based on fusibility in grades 1, 2, 3, and 4 but this has been without value to either the producer or consumer. By this new classification based as it is on the properties required to meet service conditions, the service rather than the bricks will be classified and numbered and be the basis on which specifications will be written. All bricks which possess the properties required to meet a given service will be known according to the service it will render. Ser-

vice rather than bricks being thus classified, a given brick may serve in as many classifications as tests and service will prove it to claim.

The complete report of the committee follows.

Policy of Committee C-8

This special Committee has given a great deal of thought to the matter of formulating a definite policy for the work of Committee C-8, and as a result of its work, makes the following proposal:

In order that Committee C-8 should function most efficiently, so that it may be of the greatest service to both the producers and users of refractories it is felt that the present plan of organization should be revised and that a new form of organization should be set up in which the Chairman should be relieved of the responsibility and detailed work of the Sub-committees and that this responsibility should be vested in a coördinating Committee which in the proposed By-laws is called an Advisory Board composed equally of producers and consumers. This form of organization is set forth in the proposed By-laws at the beginning of this report.

With this new form of organization the work of the Committee should proceed along the following lines:

(*a*) The formulation of a Service Classification of Refractories. This has been undertaken by your Committee and is made a part of this report.

(*b*) An Industrial Survey of furnaces and furnace conditions in accordance with this Service Classification. This work is to be taken up by the Sub-committee on Industrial Survey.

(*c*) The definition and interpretation and further development of the tests. A proposed Sub-committee on Tests and Specifications will undertake this work.

(*d*) The preparation of specifications. This work will be done by a Sub-committee on Tests and Specifications in coöperation with the Sub-committee on Industrial Survey both working together under the Advisory Board.

In the matter of drawing specifications, the Committee proposed that it shall be the policy of Committee C-8 to draw specifications only for general classes of refractories for which there is a commercial demand and not to draw specifications for special isolated requirements.

In order that the work of the Sub-committee on Tests and Specifications through its section may go forward with maximum efficiency and coordination, it is recommended that each section should adopt the same method of attack.

(*a*) That the first step should be the preparation of clear cut definitions of the property that the section is studying.

(*b*) That a careful study should be made of the various tests with a view to developing limitations and the proper interpretations of their results.

(*c*) That special attention should be given to the adaptation of each test to its use in specifications and that further developments should be immediately studied. Many of our present tests are not adapted in their present form to application in commercial specifications.

Service Classification

This special Committee has felt that one of the most important pieces of work it had to perform was to formulate a classification for refractories based on service conditions. It believes that in the final analysis it is service that the consumer purchases and that no method of classifying refractories could be satisfactory that is not based upon this principle.

SERVICE CLASSIFICATION OF REFRACTORIES			LOAD								
			UNIMPORTANT			MODERATE			IMPORTANT		
			ABRASION UNIMPORTANT	ABRASION MODERATE	ABRASION IMPORTANT	ABRASION UNIMPORTANT	ABRASION MODERATE	ABRASION IMPORTANT	ABRASION UNIMPORTANT	ABRASION MODERATE	ABRASION IMPORTANT
SLAG ACTION	UNIMPORTANT	SPALLING UNIMPORTANT	1	2	3	4	5	6	7	8	9
		SPALLING MODERATE	10	11	12	13	14	15	16	17	18
		SPALLING IMPORTANT	19	20	21	22	23	24	25	26	27
	MODERATE	SPALLING UNIMPORTANT	28	29	30	31	32	33	34	35	36
		SPALLING MODERATE	37	38	39	40	41	42	43	44	45
		SPALLING IMPORTANT	46	47	48	49	50	51	52	53	54
	IMPORTANT	SPALLING UNIMPORTANT	55	56	57	58	59	60	61	62	63
		SPALLING MODERATE	64	65	66	67	68	69	70	71	72
		SPALLING IMPORTANT	73	74	75	76	77	78	79	80	81

Temperature indicated by prefixing proper letter to number.
H = High Temperature
M = Moderate "
L = Low "

Example: M-21 indicates moderate temperature, unimportant load, unimportant slag action, abrasion and spalling both important.

Fig. 1.

A number of modifications of the idea have been proposed and examined. Several plans, while they had the merit of being concise, were open to certain objections in that they involved assumptions regarding the mutual dependence of certain properties. The final basic classification chosen by the Committee as being its opinion free from such objections is shown in Fig. 1, attached herewith.

This classification involves five fundamental qualities, *viz.*, tempera-

ture, load, abrasion, slagging and spalling, and has assumed that there may be three degrees of resistance required for each quality, *viz.*, unimportant, moderate and important. Such a classification as given in the diagram results in eighty-one possible classes. It is believed that the classification is sufficiently comprehensive to cover all possible requirements and should, therefore, be free from objections which would have been raised to some of the more concise forms previously mentioned.

On studying this comprehensive scheme, the Committee was struck by our present meagre knowledge of the requirements for many of these classes and it was believed, for the present at least, that it would be better to commence our work on a simpler scheme of classification that should be so chosen as to be capable of expansion, at any time should the demand arise, into a more comprehensive form. The Committee believes it has accomplished this simplification by using a comprehensive scheme as a foundation, and by choosing for our preliminary form the four classes taken at each corner of the main structure. These are indicated in the plate by the crossed hatched squares (Fig. 1). It will be noted that this is simply omitting for the present, one of the degrees of variation in each of the fundamental qualities, *i. e.*, the moderate degree.

CLASS H, M, OR L	TEMPERATURE	ABRASION	LOAD	SPALLING	SLAG
1	Yes				
3	"	Yes			
7	"		Yes		
9	"	Yes	"		
19	"			Yes	
21	"	Yes		"	
25	"		Yes	"	
27	"	Yes	"	"	
55	"				Yes
57	"	Yes			"
61	"		Yes		"
63	"	Yes	"		"
73	"			Yes	"
75	"	Yes		"	"
79	"		Yes	"	"
81	"	Yes	"	"	"

FIG. 2.—Summary of tests required.

This simplified scheme, then, gives only 16 classes, which it is believed will be ample for our present purpose; and yet these 16 classes are so chosen that, should the demand arise in the future, the further extension may be readily inserted without destroying the work that has already been done. By adopting this scheme, the work will be brought to within a reasonable compass in view of our present knowledge of furnace conditions and requirements.

In Fig. 2 herewith is given a summary of the test requirements for the different classes of service in accordance with this scheme of service classification. It will be noted that the test requirements for Class 1, for instance, are merely that of temperature, whether it be high, medium or low. These

test requirements increase to five in Class 81 which would have a requirement for temperature, abrasion, load, spalling and slagging. This second diagram should be of great importance in directing the work of the proposed sub-committee on tests and specifications. It indicates that at the present time we are only in a position to write specifications for Classes 1, 7, 19 and 25 and as a matter of fact, our existing load test and spalling test will both require revision to adapt them to use in specification. This summary also points out the necessity for immediate work in developing a suitable test for abrasion and slagging.

It is believed that the proposed by-laws will cover many of the situations which have handicapped Committee C-8 in its work in the past. The proposed scheme of organization will relieve the Chairman of the immediate responsibility for the work of the sub-committees and place this responsibility on the Advisory Board. Our past experience has indicated

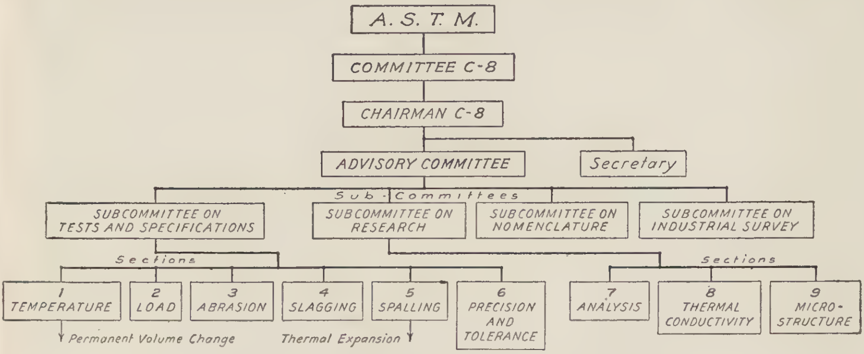


FIG. 3—Proposed organization Chart of Committee C-8.

that this will be a desirable form of administration. Under these By-laws, the organization of the Committee will be in accordance with the organization chart attached to this report.

Under the Chairman will be the Advisory Board, and under the Advisory Board will be the four standing Sub-committees, *viz.*, Tests and Specifications, Research, Nomenclature, and Industrial Survey.

The Sub-committee on Tests and Specifications will have as required under the proposed service classification, sections on Temperature, Load, Abrasion, Slagging and Spalling, which are the standard tests and in addition a section on Precision and Tolerance which will, as in the past, continue to make a critical study of the results obtained by the various proposed methods. This Sub-committee will be charged with the development of Standard Tests and Standard Specifications.

The Sub-committee on Research will consider all of those subjects which at the present time are not immediately applicable to specifications

so that at present it would have sections handling Chemical Analysis, Thermal Conductivity, and Micro Structure. This Sub-committee would automatically handle any new method of testing or investigation. The Research Sub-committee would also be available to assist any of the sections of the Sub-committee on Tests and Specifications.

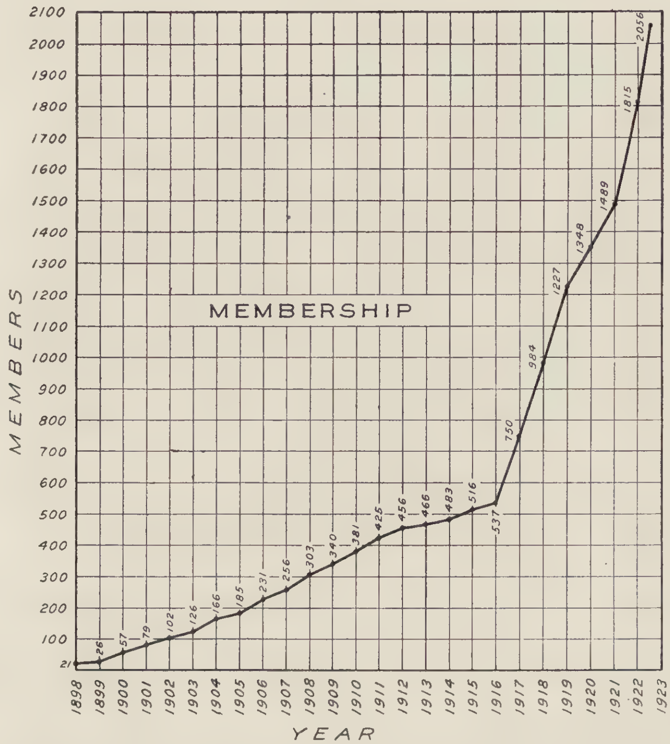
The Sub-committee on Nomenclature is more or less a formal Committee appointed at the request of the Society to coördinate the work of Committee E-8 on Nomenclature with the work of the Standing Committees.

The Sub-committee on Industrial Survey will report on the classification of furnaces and furnace conditions in accordance with the standard form of service classification presented in this report. This Sub-committee, of course, will cöoperate under the Advisory Board with the Sub-Committee on Tests and Specifications.

It will be noted that the present form of organization has eliminated several of our present Sub-committees. Their work will be merged with certain of the sections of the Sub-committee on Tests and Specifications; for example, the work on Permanent Volume Change will be handled by the Section on Temperature, and Thermal Conductivity will be handled by the Section on Spalling. The present special Committee on Magnesite will be discontinued as the proposed scheme of service classification does not require such sub-division.

ACTIVITIES OF THE SOCIETY

WE HAVE MORE HORSE POWER BUT NO MORE SPEED—WHY?



Twenty personal and six corporations is our June 15 to July 14 record of acquisitions. Growth in membership is shown here graphically.

NEW MEMBERS RECEIVED FROM JUNE 15 TO JULY 14

PERSONAL

Campbell, Thomas, Wunderlich Ltd., Box 474, Sydney, New South Wales, Australia, Works Manager.

Cartwright, George, P. O. Box 2, Darby, Pa., Proprietor, Darby Fire Brick Co.

Decker, William More, Jr., 32 St. James Pl., Buffalo, N. Y., Secy.-Treas., Hygeia Glass Corp., Lancaster, N. Y.

Gevy, Addison H., Glen-Gevy Shale Brick Co., Shoemakersville, Pa., Superintendent.

Greenlee, Fred W., Linerville, Ia., Student.

Hysell, Eugene J., Buckeye Tile Co., Chillicothe, Ohio, Vice-President and Manager.

Lunn, C. A., Consolidated Gas Co., of New York, 130 E. 15th St., New York City, Chief Chemist.

Menart, E. G., 67 Neal Ave., Newark, Ohio, Enameling Superintendent, The Wehrle Co.

Miller, C. F., c/o Root Glass Co., Terre Haute, Ind., Chemist.
Nyar, Mulkh Raj, Box 43, W. Lafayette, Ind.
Owen, Thomas Wilfred, 1104 145th St., East Chicago, Ind.
Rice, William E., 42 Rice St., Alliance, Ohio, Fuel Section, U. S. Bureau of Mines, Car Manager, Laboratory Car "Holmes."
Sanborn, Paul H., Chemist, Jeffery-Dewitt Insulator Co., Kenova, W. Va.
Seiler, Carl, 860 Drexel Bldg., Philadelphia, Pa., Representative of the Roessler and Hasslacher Chemical Co.
Scott, W. J., Room 141, Industrial Bldg., Bur. Standards, Washington, D. C., Junior Engineer, Ceramic Division.
Serpa, Frank, Rehoboth, Mass., Superintendent, Enameling Plant, Rehoboth Enameling Co.
Stephenson, W. S., 1321 Widener Bldg., Philadelphia, Pa., District Manager, The American Rolling Mill Co.
Suit, Harry Franklin, 214–12th St., N. W., Washington, D. C., Plating and Polishing.
Turk, Richard, 116 W. Hamilton Ave., Hamilton, Md., Porcelain Enamel and Mfg. Co.
Wilcox, Bernard, c/o Smith and Stone Electrical, Georgetown, Ontario, Foreman.

CORPORATION

Bryce Brothers Co., Glass Mfrs., Mt. Pleasant, Pa., G. S. Bryce, Treas. and Gen. Mgr.
The Electro-Alloys Co., Taylor St., Elyria, Ohio, J. B. Thomas, Treas.
A. D. Poclim & Co., Ltd., Salford, Manchester, England, David T. Taylor, Director.
The Roseville Pottery Co., Zanesville, Ohio., Russell T. Young.
United States Sanitary Mfg. Co., 1707 Arrott Bldg., Pittsburgh, Pa., A. H. Cline, Jr., Secy.
Peoples' Gas Light and Coke Co., 122 S. Michigan Ave., Chicago, Ill. H. H. Clark, Fuel Engineer.

The members who are actively engaged in securing new applications for membership are shown in the following list:

Name	Personal	Corporation
N. E. Loomis		1
Donald E. Sharp	1	
Paul E. Cox	1	
P. H. Swalm	1	
R. D. Landrum	1	
F. C. Flint	1	1
R. K. Hursh	1	
W. L. Shearer	1	
Karl Turk	4	
H. H. Clark		1
Office	9	3

Total 20 Personal, 6 Corporation

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Howard C. Arnold of St. Louis has moved to 5305 Delmar Blvd.

E. B. Baker of the Detroit Star Grinding Wheel Company is living at 764 Military Ave., Detroit, Mich.

Fred S. Bell of the Mandle Clay Mining Company gives as his address, 6645 Waterman Ave., St. Louis.

Richard Broadley, formerly of Champaign, Ill., has moved to 528 E. Jackson St., Mexico, Mo.

H. D. Callahan of Columbus is now with the Northwestern Terra Cotta Co., 2525 Clybourn Ave., Chicago, Ill.

Benjamin F. Carter of Peoria, Ill., writes that he is now living at 5905 Madison Ave., Bartonville, Ill.

Bertram L. Cassady, whose name has been listed among those whose addresses are unknown is with the Wellsville Fire Brick Co., Wellsville, Mo., with headquarters at 144 E. Latimer St., Tulsa, Okla.

Herman L. Cook, who has been at the University of Illinois is living at 327 N. Hazel St., Danville, Ill.

Sanford S. Cole gives 49 Jane St., Hornell, N. Y. as his address.

Robert M. Corl is now located in the National Supply Bldg., Huron St., Toledo, Ohio.

M. F. Cunningham writes that he is with the Waltham Grinding Wheel Co., Waltham, Mass.

John Fitzgerald formerly of Niagara Falls, N. Y. has moved to 572 Terrace Ave., Clifton, Cincinnati, Ohio.

M. S. Gifford who has been living at Libertyville, Ill., has recently moved to Lake Bluff, Ill.

Raymond Gilmore has resigned his position with the Laclede-Christy Clay Products Co., St. Louis and is living at 7710 Linwood Ave., Cleveland, Ohio.

A. F. Greaves-Walker, president of the AMERICAN CERAMIC SOCIETY, has moved to Stevens Pottery, Ga., where he has accepted a position as Vice-President and Manager of Operations with Stevens Brothers and Co., manufacturers of clay products. Mr. Greaves-Walker was formerly Production Manager with the American Refractories Co., at Pittsburgh, Pa.

Marshall W. Harris of the University of Illinois has secured a position at Ada, Okla.

J. W. Hepplewhite, recently of Manville, N. J. is with the Edwin M. Knowles China Co., East Liverpool, Ohio.

R. M. Howe has notified the Secretary's office that his address is 1120 Lancaster Ave., Pittsburgh, Pa.

Walter A. Hull who has been with the Bureau of Standards at Washington, D. C., has moved to Chicago, Ill., where he is associated with the Northwestern Terra Cotta Co.

Richard E. Jones of Tarentum, Pa. has moved to 620 E. Eighth Ave.

Harry J. Knollman asks that his mail be sent to 325 E. Ave. 31, Los Angeles, Calif.

George A. Loomis of Steubenville, Ohio is moving to 322 South Spring St., Los Angeles, Calif.

Gilbert McCall is living at 3018 K St., Sacramento, Calif.

George J. Openhym of White Plains, N. Y., is spending the summer at Scarsdale, N. Y.

R. I. Montgomery has moved from 1624 Niagara Ave. to 533 10th St., Niagara Falls, N. Y.

Carl Perg, formerly of Kalamazoo, Mich., is living at Des Plaines, Illinois.

B. S. Radcliffe has left the St. Louis Terra Cotta Co., and is now with the Northwestern Terra Cotta Co., Chicago, Ill.

Charles Rose of St. Louis has recently moved to 447 9th St., Niagara, N. Y.

Oscar Shearer is now living at 5 N. Karlov Ave., Chicago, Ill.

Vincent DeP. Schildmeyer of St. Bernard, Ohio, has moved to 6450 Kennedy Ave. Cincinnati, Ohio.

Dr. Felix Singer gives as his permanent address Berlin-Charlottenburg, Carmerstr. 18, Germany.

T. D. Tefft is now located with the Thurber Brick Co., Thurber, Texas.

Bruce F. Wagner of Ames, Ia., has moved to 3109 Home Ave., Berwyn, Illinois.

Alan G. Wikoff, Industrial Editor of "Chemical and Metallurgical Engineering," Chicago office is now in the New York office of the McGraw-Hill Co., 10th Ave. at 36th St.

B. W. Willson, ceramics student at Ames, Ia., is spending the summer in Galesburg, Ill.

J. A. Wilson of Elwood, Ind., has recently moved to Kittaning, Pa.

Harold G. Wolfram who has been studying ceramics at the University of Illinois is now with the Bureau of Standards, Washington, D. C.

AMERICAN CERAMIC SOCIETY SUMMER MEETING AUGUST 8, 9, 10, 11

TOLEDO—DETROIT—FLINT

Plant Visits

Glass House Refractories—Modern Machine Methods of making glass bottles, window and plate glass—Porcelain spark plug cores and assembled plugs—Enameled, steel and iron, common brick, grinding wheels, art pottery, and automobiles.

Pleasure Trips

Midnight on the Detroit river and Lake St. Claire. More tonnage travels on Detroit river than enters the metropolitan harbors, more than moves from New York, London, Hong Kong and Liverpool combined. The lake trips from Detroit are unsurpassed in scenery and comfort.

Belle Isle famous the world around as a park of beauty, refinement and educational opportunities; extensive aquarium, horticultural and zoölogical collections; concerts, boating, swimming motoring and casinos.

Headquarters

Secor Hotel, Toledo—August 8

Wolverine Hotel, Detroit—August 8, 9, 10, 11

Itinerary

August 8—8 A.M.	Hotel Secor. Dr. H. W. Hess and A. S. Zopfi, committee in charge.
12 M.	Complimentary lunch at The Toledo Yacht Club
7:25 P.M.	Leave on Michigan Central train 306
9:00 P.M.	Arrive Detroit (dinner en route)
	F. H. Riddle, Mrs. W. B. Stratton, H. F. Royal, H. S. McMillan, Jos. Hoehl, J. R. Kempf, committee in charge.
August 9—9 A.M.	Chartered bus to Ford Motor Co. (experimental continuous pour plate glass plant) and Champion Porcelain Co. (Dressler Tunnel kiln operating at cone 18)
	Complimentary luncheon at Champions
2 P.M.	Trips chosen by delegates
	Porcelain Enameling and Mfg. Co.

	Detroit Stove Works
	Wolverine Porcelain Enameling Co.
	Pewabic Pottery Co.
	Detroit Brick Plants
7:30 P.M.	Boat Ride—Dancing on deck
August 10—8:10	Leave by special cars for Flint
	T. G. McDougal, P. D. Helser and S. J. McDowell, committee in charge.
	A. C. Spark Plug Company (complete production and assembling of plugs), novel tunnel kiln operating at high temperatures.
	Buick Motor Co.
8:00 P.M.	Dinner with entertainment and dancing
	Hotel Wolverine
August 11—9:00 A.M.	Special bus to Detroit Star Grinding Wheel Co.
	River Rouge plants of Ford Motor Co.
	The Ford Steel plants
	Ford new plate glass plant
Week End	Lake trips as shall be chosen by the delegates.

COMMITTEES FOR ANNUAL MEETING OF THE AMERICAN CERAMIC SOCIETY

Atlantic City, N. J., February 4, 5, 6, 7, 8, 1924

Executive Committee

Andrew Foltz, Chairman
R. H. Minton, Vice-Chairman
C. A. Bloomfield
Abel Hansen
Chas. Howell Cook
August Staudt
F. W. Dinsmore
D. P. Forst
R. R. Valentine
H. Mueller
E. C. Hill
H. K. Kimble
G. H. Brown, Secretary

Railroad Transportation

Werner Malsch, Chairman
Geo. W. Gilks
Chas. E. Jacquart

Hotel Accommodations

Frederick Stanger, Chairman
Hubert Somers
Chas. H. Lovett
D. W. Scannel

Publicity

L. R. W. Allison, Chairman
C. W. Hill
Franklin G. Lord

Service

C. F. Geiger, Chairman
Robert E. Anderson
W. L. Howat
R. E. Long
John M. Kreger

Banquet

R. H. Minton, Chairman
F. A. Whitaker
E. C. Hill
Frederick Stanger

Finance

G. H. Brown, Chairman
C. W. Crane
E. V. Eskesen
August Staudt
C. S. Maddock, Jr.
M. M. McHose
D. R. Edgar
Abel Hansen

Reception

H. F. STALEY, CHAIRMAN
R. L. Clare
August Staudt
R. P. Hazlehurst
Otto W. Will

Entertainment of Ladies

MRS. G. H. BROWN, CHAIRMAN
Mrs. A. Foltz
Mrs. R. H. Minton
Mrs. E. E. Hill
Mrs. F. Stanger
Mrs. R. P. Hazlehurst

Trips

D. P. FORST, CHAIRMAN
Leslie Brown
John A. Williams
Chas. H. Kerr
Geo. Simcoe
O. O. Bowman, 2nd
G. M. Tucker
H. A. Plusch
G. E. Hoffman

Exhibit

IRA A. SPROAT, CHAIRMAN
K. E. Ward
John. P. Goheen
Eric W. Turner
C. T. H. Phillips

THE PITTSBURGH DISTRICT SECTION MEETING[1]

The meeting held on June 8, 1923, was called to order by Chairman, Professor A. Silverman.

Dr. E. W. Tillotson reported a balance in possession of the Finance Committee for the Silver Jubilee Convention. It was noted that this should be returned pro rata to the companies who had donated this money.

Chairman Silverman reported that the printing of stationery for the different Sections of the SOCIETY could be greatly simplified by having the new sectional and national officers take their office at the same time. It was voted that this report be received for future consideration.

The following committees were appointed to serve this year:

Program Committee: J. S. McDowell and F. C. Flint.

Entertainment Committee: R. M. Howe and H. G. Willetts.

Motion pictures of the Corning Glass Works were shown through the courtesy of J. C. Hostetter.

SUMMER MEETING OF THE NEW JERSEY CLAY WORKERS ASSOCIATION AND EASTERN SECTION OF AMERICAN CERAMIC SOCIETY

The Summer Meeting of the New Jersey Clay Workers Association and Eastern Section of the AMERICAN CERAMIC SOCIETY was held at the Trenton Country Club, Trenton, N. J., on Friday, June 29th.

The meeting was opened at one o'clock with a luncheon served in the ball room of the Club. Mr. Andrew Foltz acted as toast-master and a number of interesting speeches were given,—notable among which were those by Messrs. Charles Howell Cook, Chas. W. Crane, T. A. Randall, W. P. Blair, R. H. Minton and Thos. Campbell of Sydney, Australia.

[1] By H. G. Schurecht, Secretary Pittsburgh District Section, AMERICAN CERAMIC SOCIETY.

Following the luncheon a brief business session was held, President Andrew Foltz in the Chair. The following reports were then submitted for approval: Report of 1922 Summer Meeting, G. H. Brown, Secretary; Report of Executive Committee—R. H. Minton, Chairman; President's Report—Andrew Foltz.

Attention was called to the fact that the Eastern Section is to have charge of the arrangements for the 1924 Annual Meeting of the AMERICAN CERAMIC SOCIETY to be held in Atlantic City during February. President Foltz named the committees which have been chosen to make the 1924 Meeting a success in every way and one long to be remembered.

President Foltz announced the appointment of the following committee to be in conference from time to time with a committee of the Board of Trustees of Rutgers College concerning the work of the Ceramics Department:—

Abel Hansen, Pres., Fords Porcelain Wks., Perth Amboy, N. J.
H. A. Brown, Pres., Lenox, Inc., Trenton, N. J.
C. A. Bloomfield, Metuchen, N. J.
C. H. Cook, Pres., Cook Pottery Company, Trenton, N. J.
F. W. Dinsmore, Imperial Porcelain Wks., Trenton, N. J.

At the close of the business session, a very interesting paper entitled "The Application of Tunnel Kilns in the Firing of Ceramic Wares" was presented by Prof. Carl B. Harrop of Columbus, Ohio. Messrs. Conrad Dressler and T. G. McDougal contributed interesting discussions to Prof. Harrop's paper.

Mr. Chester C. Treischel, Secretary of the White Wares Division, AMERICAN CERAMIC SOCIETY, discussed "Feldspar Classifications and Specifications" and briefly outlined the work which the White Wares Division is doing.

At the close of the afternoon session it was found that a total of 110 members and guests had registered,—this being the record attendance at any Summer Meeting of the Section. A number of new members were enrolled and the meeting was voted a most successful one in every way.

AN EXPRESSION OF OPINION ON VALUE OF THE JOURNAL

M. R. Cuthbertson of Oroya, Peru, South America writes the following letter which is of unusual interest to the readers of the *Journal.*

". . .As to the *Journal* let me say that I belong to another technical organization which costs me double the amount of dues for the AMERICAN CERAMIC SOCIETY and the monthly publication gotten out by this institute cannot compare with the *Journal* for technical value.

"The paper in question leans altogether too much to editorials written by men who cannot for some reason publish their writings elsewhere. For this reason we must wade through pages of pseudo-technical bunk in hope of sometime discovering something of use to us.

"I have no definite information, but I should judge that of all technical papers written perhaps one per cent of the information contained in them may be applied without much change. One paper, I remember well, for I combed it from beginning to end hoping to gain some information as to the hardness of the original material, the size, the content of moisture, or the size of the machines used. To me the paper was useless.

"This is not so with the *Journal of the American Ceramic Society.* Whether the writers are more practical, or whether they are simply better able to take in all angles of the subject, I cannot say. This much I know. I am making common, fire and silica

brick, and naturally am more interested in that line of ceramics than in the manufacture of glass, but I have been able to pick information of value to me in my line from a paper on the manufacture of glass in the *Journal.*

"When you consider that we are operating kilns at 12,000 and 14,000 feet altitude and lack of pressure and oxygen content produces problems in combustion, and that I can still get information of value on combustion from the *Journal,* I think we have good reason to think well of our contributors."

OBITUARIES

Arthur T. Beach

Arthur T. Beach, President of the Beach Russ Company, manufacturers of pumps, and President of the Abbé Engineering Company, manufacturers of grinding and pulverizing machinery, of New York, died at his home in Brooklyn, N. Y., on June 16. His death was due to heart failure. Mr. Beach was born in Connecticut in 1862. He founded the Beach Russ Company in 1891 and in 1912 became President of the Abbé Engineering Company. Mr. Beach is survived by three sons, all of whom were associated in business with him.

H. H. Preston

Word has been received of the death of H. H. Preston of Pittsburgh, Pa. Mr. Preston was employed with the J. W. Cruikshank Engineering Co., of Pittsburgh and was a member of this SOCIETY.

Haydn E. Vaughan

On account of the death of Haydn E. Vaughan, one of the younger members of the AMERICAN CERAMIC SOCIETY, his father Edward Vaughan, has asked that his membership be transferred to Willis C. Mellott, one of his classmates. Haydn Vaughan was a student at the University of Pittsburgh and lived at 7107 Mt. Vernon Avenue, Pittsburgh.

NOTES AND NEWS

PLASTICITY RESEARCH FUND AT LAFAYETTE COLLEGE

A letter to the Editor from Eugene C. Bingham, Professor of Chemistry, Lafayette College, Easton, Pa., states that the results of the work carried on during the past year have been so successful that he has made a contribution of $1200 toward the continuance of the work for another year. The full announcement of the character of this work on plasticity is found in the *Bulletin* **1** [11], 325 (1922). A report of the Research Committee of Lafayette College makes the following statement concerning this work.

"The plan this last year has been eminently successful, a large amount of information having been secured which will be published in due course. For example, a new method for measuring plasticity has been worked out which greatly simplifies the measurement of plasticity and reduces the time required to a tenth of that formerly required. As a result of this year's success, Lafayette College is ready to continue the present arrangement and $1900 has already been guaranteed toward the necessary $3600.

"It is proposed to continue the study of the fundamental problems of viscous and plastic flow, and it is hoped that the results may be applicable in flow connected with a single industry. The results of the researches will be made available through publication."

FUEL EFFICIENCY AT BRICK KILNS

Operators of numerous brick plants are putting into practical application the fuel-efficiency data obtained as the result of the series of burning tests at industrial kilns recently conducted by the laboratory car Holmes of the Department of the Interior, in coöperation with the heavy clay trade associations, according to reports submitted to the Bureau of Mines by its field agents.

A notable example has been reported to the Bureau from Birmingham, Ala., in the case of an operator of two brick plants near that city who had been operating his kilns without especial regard to modern, efficient methods. This operator, being a member of certain brick trade associations, receives through these associations the results of improved methods of burning as developed by kiln-burning tests conducted under the direction of the Ceramic experiment station of the Bureau of Mines at Columbus, Ohio. Against the advice of the old practical burner and everyone else connected with the work, the superintendent at one of the plants decided to try out the method as outlined by the tests made by the Bureau of Mines. The results were more than satisfactory. At this plant it formerly took about 9 days to burn a kiln with a consumption of over 1400 pounds of coal per 1000 brick. The company had contemplated building more kilns to take care of the demand. They now burn off the kiln in 5 to 6 days and use under 900 pounds of coal per 1000 brick. Instead of building more kilns, some of the other kilns are now idle, while the plant still maintains its capacity.

SUMMER MEETING OF THE PACIFIC NORTHWEST CLAY-WORKERS' ASSOCIATION

Driers and Drying

We invite drying specialists to come this way on their summer vacations to attend the summer meeting of the Pacific Northwest Clayworkers' Association held in Seattle, Wash., on August 25. *One big meeting* devoted to *one big subject* of vital importance to all clay manufacturers, in the *one big vacation* center of the country, in the vacation time.[1]

Seattle and the Puget Sound country furnish an ideal location for a summer vacation: Cool spring-like weather, salt water, fresh water lakes, snow-covered mountains, big deep cool forests, fishing, boating—any sport you wish; any variety of accommodations—metropolitan life in Seattle to camps on the beaches and mountains. Drive out in your car, visit the big clay plants of the Pacific Northwest and see the wonderful possibilities for future development in all branches of the clay and ceramic industry.

Our association has a membership of over 50 and is only 6 months old. 70 attended the last general association meeting and over 30 came to the Brick, Tile and Sewer Pipe Division Meeting held June 2.

[1] For particulars, address Hewitt Wilson, Secy.-Treas. U. of Washington, Seattle, Washington.

PACIFIC NORTHWEST CLAYWORKERS' ASSOCIATION[1]

Reports from Brick, Tile and Sewer Pipe Division Meeting

The program of the Pacific Northwest Clayworkers' Association on auger machines, lamination and brick-laying school work proved to be instructive, practical and of financial value to those who attended this meeting in June.

Mimeographed copies of Mr. Adderson's paper on lamination and die working and the ceramic department's 11 page outline of the same subject can be obtained from the office of the secretary, ceramic engineering department, University of Washington. The request from non-members of the association must be accompanied by 25 cents to cover the cost of the mimeographing and postage.

As a result of a resolution passed at the meeting, the following telegram was sent to the American Construction Council in the name of the Association:

Franklin D. Roosevelt, 120 Broadway, New York City: "We understand that the American Construction Council proposes to undertake a publicity campaign to stop new construction in all parts of the country for ninety days. We are not familiar with conditions in the East except from news reports such as *Literary Digest*, but understand that millions of dollars of work have already been indefinitely postponed. We feel that building is a basic industry and highly essential to national prosperity and delay at this time will result in a serious depression. In Pacific Northwest building is only beginning to revive after a numbeı of years slump. We do not have labor shortage here and prices of building materials are not unreasonable. Our manufacturers, architects, contractors, builders and labor need work this year. Your proposed action will tend to drive our skilled mechanics to other occupations and to other sections and result in a permanent loss. If any warning is needed we feel that the publicity already given your proposed action is more than ample and we earnestly protest the continuation of such propoganda covering the country as a whole and the Pacific Northwest in particular. Our association is composed of manufacturers and employees of brick, tile, sewer pipe, terra cotta, pottery and other clay product industries of states of Washington, Oregon, Idaho and British Columbia. At meeting held yesterday a resolution was passed that this protest be wired to you." Pacific Northwest Clayworkers' Association, Hewitt Wilson, Secy.

We feel that it is imperative for us to unite all our efforts in encouraging building at this time and to resist movements of this kind which tend to discourage construction. Have the various organizations of your community sent in protests to the American Construction Council?

VOLUNTARY ADOPTION OF STANDARDS OF QUALITY

EDITOR'S NOTE:

Standards of Quality.—Much profit has resulted from standardization of size, shape and design. The elimination of unnecessary varieties has been practiced for a sufficient time and in a large enough number and varieties of industries to demonstrate it to be of vital economic importance. So it will be with standardization of quality.

On page 191 of the *Bulletin* section of June *Journal* appeared a communication on this subject from Julius H. Banner, President of U. S. Chamber of Commerce. His

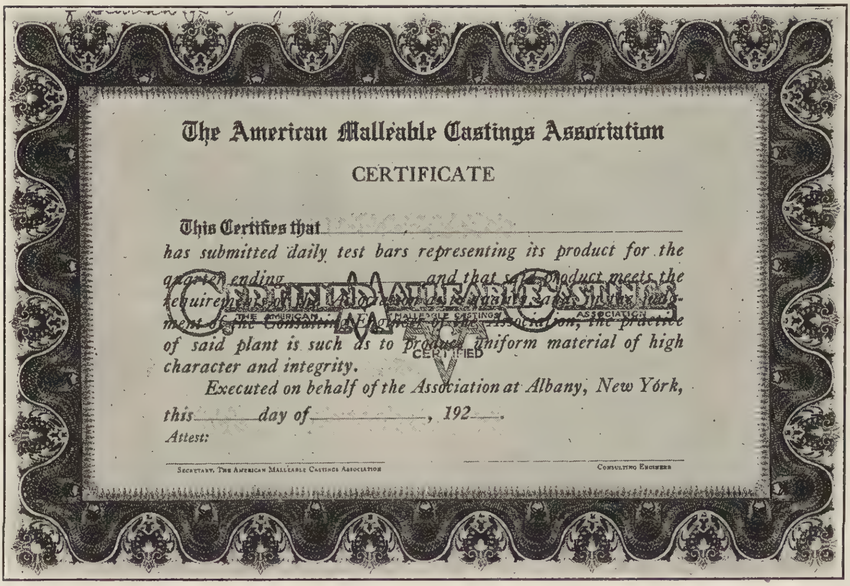
[1] For a summary of Mr. Cook's work in his brick-laying school, address, Mr. C. W. Cook, 3135 Broadway North, Seattle.

statements rang so true that the material from which he drew his observations was sought and the following letter and data were obtained. This letter under date of May 22 was written by C. L. Ishleman of The American Malleable Castings Association to E. H. McCullough, Manager, Fabricated Production Department, U. S. Chamber of Commerce.

How the American Malleable Castings Association Establishes Quality Standards for the Products of Its Members

"This letter will reply quite fully to the recent *Bulletin* of the United States Chamber of Commerce under the caption 'Voluntary Adoption of Standards of Quality.'

"For more than ten years, The American Malleable Castings Association has been carrying on the work of quality standardization now so urgently recommended by Secretary Hoover and the Chamber of Commerce of the U. S.


The American Malleable Castings Association

CERTIFICATE

This Certifies that ______

has submitted daily test bars representing its product for the quarter ending ______ and that said product meets the requirements [illegible] in the judgment of the Consulting Engineers of the Association, the practice of said plant is such as to produce uniform material of high character and integrity.

Executed on behalf of the Association at Albany, New York, this ____ day of ______, 192__.

Attest:

Secretary, The American Malleable Castings Association — Consulting Engineers

"By coöperative effort and scientific research the malleable iron industry has really found itself, and is today recognized as one of the country's outstanding examples of what well directed Association effort can accomplish in producing a uniform product of the highest quality and integrity.

"As the voluntary establishment of quality standards has been the keynote of our Association effort for many years, we are in hearty sympathy with the Department of Commerce in their present effort to use this means of protecting consumer interests and take pleasure in giving you the following outline of our effort in this direction."

"Ten years ago, there was little definiteness to the physical properties of malleable iron and there were practically as many varieties as there were foundries making it.

"Every foundry had its own theories, many of which were based on meager and insufficient knowledge of the whole subject. The annealing process by which the casting loses its brittleness and takes on the valuable properties of malleability was accredited to reasons that later have proved erroneous.

"In fairness, it must be said that even at that time, there were a number of manufacturers who were striving independently to improve the quality of malleable iron by scientific study and research. Whatever discoveries were made by them were jealously guarded as trade secrets and the industry as a whole did not benefit. This policy proved a boomerang to the industry in that inferior castings still being made by old rule-of-thumb processes threatened to stigmatize all malleable castings regardless of quality.

"This was the condition prior to 1913 before scientific research and testing of materials through coöperative effort were begun.

"The American Malleable Castings Association, now made up of about sixty representative companies in this industry, at that time comprised about twenty-five members. This group determined to enlarge their field through coöperative action and to take certain, definite steps toward raising the standards of the industry. They decided

1.—To go the limit in the matter of metallurgical research regardless of cost, in order to make *uniform*, high-grade castings.
2.—To disseminate this scientific knowledge among all members so that the entire Association could make such castings.
3.—To see that every public statement regarding the progress should be conservative and that it should be accompanied by accurate data to substantiate it.

"At this time a Research Department was organized and Professor Enrique Toucedah an eminent Consulting Engineer of Albany, New York, was retained to carry on the research work of the Association. The veil of mysticism that had been woven about the production processes of some of the more successful foundries was lifted and the best from each was adopted.

"Since that time the Consulting Engineer has labored unceasingly to instruct members in sound plant practice and correct principles of manufacture. Thus it is seen that in the obtaining of business members of the American Malleable Castings Association are competitive, but in the improvement of their product, coöperative. Through research, the Association has become an instrument of service to all industries in which malleables are used and has raised the manufacture of malleable iron from a hit-or-miss proposition to a scientific basis."

Test Bars Submitted Daily by Every Member

"When the research work was started one of the first requirements was that each member of the Association submit test bars daily to the Consulting Engineer for an independent determination of tensile strength, elongation and other important physical properties. This practice not only shows the quality of each member's product, but furnishes data on which a comparison could be made of the product of the whole membership. Equally important, it also served as a direct and positive measure of the improvement in quality from month to month. This practice of requiring every member to submit test bars from daily heats, still continues and is supplemented by Inspectors, acting solely under the direction of the Association's Consulting Engineer who make frequent, unannounced calls upon member companies to check up the manufacturing processes, the product itself and in general to serve as a check upon the actual test on bars submitted by member companies. The test bar record thus reinforced by constant field investigation of plant methods may be considered as truly representative of the product."

Constantly Setting Higher Specifications at Which Members Could Aim

"At the time the research work was started, the specification of Malleable Iron of the American Society for Testing Materials called for a tensile strength of 38,000 pounds and 5% elongation in two inches. This specification while exceeding the product

of many of the foundries was, as later developed, far short of the possibilities of the metal when properly made.

"Through individual plant inspection the adoption of the more successful practices and the submitting of test bars regularly, it was not long until the majority of the plants were making a product that exceeded the A. S. T. M. specifications. Upon the direct solicitation of The American Malleable Castings Association the A. S. T. M. specifications were raised to 45,000 pounds tensile strength and $7^1/_2\%$ elongation. This higher specification was later adopted by the S. A. E. and other technical organizations.

"Inspired by its success in constantly improving the quality of malleable iron and not content to 'leave good enough alone' the Association aspired to a still higher standing for the product of its members. The result is that a new specification of 50,000 pounds per square inch tensile strength and 10% elongation has recently been adopted and again the different technical societies will be requested to raise their specifications for malleable iron.

"This latest specification is 32% higher in tensile strength and 100% higher in elongation, than when the research was begun. During this same period, other valuable properties such as uniformity, soundness, rust-resistance, and easy machining have shown even greater improvement.

"It is doubtful if, in the entire history of American industry, there exists a similar instance of a trade association requesting that the leading engineering societies increase the rigidity of the specifications covering the product of its members."

The Practice of Issuing Quarterly Certificates of Merit

"As an incentive to greater effort toward improving quality, the Association a few years ago instituted the practice of issuing quarterly certificates of merit. As the awarding of a certificate for a given quarter is wholly in the hands of the Association's Consulting Engineer the only possible way in which one can be secured by a member is through rigid adherence to requirements in connection with physical tests and integrity of product during that period. Before a certificate can be awarded to a given plant, two general conditions must prevail:

1st, the test bars from each day's production sent to the Association's laboratories must have met the Consulting Engineer's requirements for tensile strength and elongation, and

2nd, the plant practice of the member during the same interval must receive the endorsement of the visiting Inspectors.

"Out of the practice of issuing certificates to members, came the idea of Certified Malleable Castings —the product of certificate-holding plants.

"While originally intended only as a reward of merit in foundry practice, the possession of a certificate has come to be a guide by which buyers determine the source of supply for their malleables.

"It is interesting to note that frequently members have striven for years to get their name on the published list of Certified Malleable producers, even going to the expense of rebuilding their plants and revamping their equipment and foundry practice in their effort to meet the Association's requirements for Certified Malleable Castings.

"If, for any reason, the product of any member falls below the established standards, for any quarter, the name of that company is omitted from the quarterly list of Certificate Holders and his name is also omitted from the list that is part of every magazine advertisement put out by the Association. Thus it can be seen that there is a real penalty imposed should a member become careless or indifferent.

"Copy of certificate issued to member companies is attached to this letter.

QUALITY STANDARDS AS DEVELOPED BY SOME TRADE ORGANIZATIONS

American Gas Assn.—Association nomenclature, material, specifications, abbreviations and performance specifications.

Associated Metal Lath Mfgrs.—Association has standards for weight, tolerance quality and gage.

Electric Power Club.—Association numbers among its principal activities the matter of quality of standardization.

Hollow Building Tile Association.—Association has standards for weights, sectional dimensions and tolerances. (Some of these standards are only in the recommendatory stage.)

National Paving Brick Mfgrs. Assn.—Association has standard specifications for wear and tolerances and standard methods of testing.

Portland Cement Assn.—Association has standard specifications for testing which have been adopted by the U. S. Government, American Society for Testing Materials, and others.

American Malleable Castings Assn.—One of the most outstanding cases of quality standardization. Tensile strength of castings increased from 38,000 pounds to 50,000 pounds. Elongation raised from 5% to 10%. Association maintains inspection and certification service.

Cement Products Assn.—Quality standards established and adopted. Association maintains test, inspection and certification service.

REPORT OF CONFERENCE ON SIMPLIFICATION OF HOLLOW BUILDING TILE

Elimination of 23 of the 36 prevailing sizes recommended

At a meeting held June 19, 1923, at the Department of Commerce, the Standards Committee of the Hollow Building Tile Association reported to the Department's Division of Simplified Practice, the results of a survey which the Association had made of existing varieties in types, sizes, and weights of hollow building tile.

The survey showed 36 different sizes—each made in a wide variety of weights. The Committee recommended the elimination of 23 of the 36 sizes, and the retention of 13 as "standards" for the industry. A standard weight, with a permissible variation of 5% over or under the standard weight, was also recommended for each of the 13 sizes retained.

The Committee requested the Department of Commerce, through its Division of Simplified Practice, to call a general conference next October of manufacturers, architects, engineers, contractors, and builders to discuss the general adoption and use of the recommended standard sizes and weights.

Those present at the meeting were: E. R. Sturtevant, Fraser Brick Co., Dallas, Tex. H. R. Straight, Adel Clay Products Co., Adel, Ia. H. C. Downer, Malvern Fire Clay Co., Malvern, O. P. H. Bevier, National Fire Proofing Co., N. Y. C. W. Dixon, Columbus Brick & Tile Co., Columbus, Ga. F. J. Huse, Research Engineer for the Association, Chicago, Ill. E. W. McCullough, Mgr., Fabricated Production Department, Chamber of Commerce of United States, Washington, D. C. Ray M. Hudson, Division of Simplified Practice, Department of Commerce.

This is another decided step forward in the Hoover plan to reduce the cost of building construction through elimination of waste in industry, Ray M. Hudson, the Commerce Department's representative at this meeting declared as the session closed.

CALENDAR OF CONVENTIONS

American Association of Iron and Steel Electrical Engineers—Buffalo, N. Y., September 24–28, 1923.

AMERICAN CERAMIC SOCIETY (Summer Meeting)—Toledo, Detroit and vicinity, August 8, 9, 10 and 11, 1923.

AMERICAN CERAMIC SOCIETY (Annual Meeting)—Atlantic City, Feb. 4, 5, 6, 7 and 8, 1924.

AMERICAN CERAMIC SOCIETY (Exposition Meeting); Wednesday, September 19, is Ceramic Day.

American Chemical Society (Fall Meeting)—Milwaukee, Wis., Sept. 10 to 14, 1923.

American Electrochemical Society (44th Meeting)—Dayton, Ohio, September 27–29, 1923.

American Face Brick Association (Southern Group)—West Baden, Ind., November, 1923.

American Gas Association—Atlantic City, October 15–20, 1923.

American Institute of Electrical Engineers—Del Monte, Calif., October 2–5, 1923.

American Society of Sanitary Engineers—Davenport, Ia., September 10–13.

Common Brick Manufacturers of America—Los Angeles, week of Feb. 11, 1924.

National Exposition of Chemical Industries—New York City, September 17–22.

National Safety Council—Buffalo, N. Y., October 1–6, 1923.

New York Hotel Association—New York City, November 19–24, 1923.

Power and Mechanical Engineers—New York City, December 3–8, 1923.

STANDING COMMITTEES FOR 1923–1924
AMERICAN CERAMIC SOCIETY

Research:	W. M. Clark, E. W. Washburn, Paul E. Cox, A. V. Bleininger, F. H. Rhead, R. R. Danielson, E. W. Tillotson, R. T. Stull, M. L. Bell, E. C. Hill, F. K. Pence
Standards:	R. F. Geller, *Chairman* (*a*) *Definitions:* A. S. Watts, M. F. Beecher, J. S. McDowell; (*b*) *Raw Materials:* D. W. Ross, M. C. Booze, E. C. Hill; (*c*) *Standardization of Tests:* W. T. Stephani, E. P. Poste, A. E. Williams, P. H. Bates, R. F. Ferguson, C. W. Hill, G. Sladek; (*d*) *Standardization of Products:* C. F. Binns, D. E. Sharp, W. G. Worcester, R. M. Howe, J. L. Carruthers, A. V. Bleininger
Geological Surveys:	Dr. S. L. Galpin, Robert W. Jones, Dr. H. Ries, W. G. Worcester, Hewitt Wilson
Data:	C. W. Parmelee, Conrad Dressler, T. D. Hartshorn, J. C. Hostetter, H. G. Schurecht, L. J. Trostel, T. A. Klinefelter, C. C. Treischel
Education:	E. W. Tillotson, A. V. Bleininger, R. H. Minton, F. W. Walker, Jr., H. F. Staley
Papers and Program:	F. L. Steinhoff, R. C. Purdy, H. S. Kirk, R. R. Danielson, A. E. Williams, Amos Potts, R. F. Ferguson, R. L. Clare, C. C. Treischel
Publications:	Forrest K. Pence, A. W. Kimes, F. H. Rhead, W. E. Dornbach, R. C. Purdy
Divisions and Sections:	A Silverman, W. E. Dornbach, E. P. Poste, A. V. Bleininger, F. B. Ortman, F. H. Rhead, H. F. Staley, A. R. Payne, R. B. Keplinger, E. E. Ayars, A. F. Hottinger, F. H. Riddle
Membership:	A. S. Zopfi, R. F. Segsworth, C. L. Sebring, D. F. Stevens, F. Stanger, Karl Turk, E. P. Poste, G. R. Truman, Atholl McBean, H. S. Turk, F. C. Flint, E. H. Van Schoick, W. D. Gates, I. E. Sproat
Rules:	L. E. Barringer, E. C. Hill, R. L. Clare, A. S. Walden, J. L. Crawford, F. H. Rhead, J. W. Wright, C. B. Harrop, S. M. Kier, August Staudt

Special Committees

Ernest Mayer Memorial:	Col. Edward Orton, Jr., F. W. Walker, A. V. Bleininger, B. E. Salisbury, Homer F. Staley
Budget:	R. D. Landrum, A. F. Greaves-Walker, F. H. Riddle, R. K. Hursh, R. C. Purdy
Representative Chem. Div. Nat. Research Council:	A. V. Bleininger
Heavy Clay Products Joint Research:	R. C. Purdy
Summer Meeting:	F. H. Riddle, A. S. Zopfi, H. W. Hess, Mrs. W. B. Stratton, H. F. Royal, Jos. Hoehl, J. R. Kempf, T. G. McDougal, P. D. Helser, S. J. McDowell
Conference of Makers and Users of Scientific Apparatus:	Charles H. Kerr, B. T. Sweely, J. S. McDowell

BULLETIN
of the
American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

Vol. 2 | **September, 1923** | **No. 9**

EDITORIAL

"HE PROFITS MOST WHO SERVES BEST"

Service and Profit.—These have a "cause and effect" relation. There is no just or lasting profit, except through service. Dishonest and incompetent service profits no one. Profit is gotten only through constructive service. A Society is an association for mutual or joint usefulness and profit.

The intent and expectation of the American Ceramic Society is that it shall render efficiently and timely the best possible constructive service. The Society has no heart, no mind, no will and no power to do other than is possessed by the members. The Society is but the means of collaboration of its members in service. The character of service to be rendered by the Society is the character of service which its members will it to be.

If a member or group of members wish a certain service from the Society, it will be necessary to do more than to wish; a service of the sort desired can be rendered only when the members themselves render such service. Those who have profited most from the Society are those who have rendered through the Society the sort of service they wish the Society shall render them.

"He profits most who serves best."

PAPERS AND DISCUSSIONS

DISCUSSION ON "ARTISTIC MODERN FAIENCE"[1]

C. Dressler:—Several years ago I heard Mr. Bleininger speak anxiously about the condition of the art of pottery, saying that it was more than ever necessary now that the latter should take an artistic direction. As he is a purely scientific man, I was very much struck with this remark. It was entirely my point of view and it greatly strengthened my opinion, as my paper indicated. I should like to encourage the discussion, because I am very much interested in the study and I have no doubt there are views which are diametrically opposed to mine. I should like to hear them, so that I might have the opportunity of defending my views.

I believe that my scheme, if tried out in a large factory might be somewhat costly because it could not be done at once. People have become so accustomed to the present methods of production that it might take quite a time to change, for the foundation of the proposal is to give freedom to the worker. That is, in fact, the whole principle.

The worker at the present moment is under a certain discipline, which is excellent for production, but which is very bad for art. He is told he must do one particular thing only. There is a great deal of division of labor, and so it is quite a small part he is concerned with. He is told also that a large order must be gotten out rapidly.

The plan I propose consists in giving the worker an opportunity to once more use his brains and his taste and feelings. As soon as you begin to do that you may disturb the whole industrial establishment, unless you regulate it and determine limits within which the worker is allowed to use judgment. That is a very important point. Somebody has to say to the worker, "You can use your brains and taste up to this point, but you must not go beyond."

Tradition has been destroyed. We have no tradition. Tradition has to be reintroduced.

Many young artists in France and other places have attempted to compete with large establishments and have failed because they have not been able to turn out the work in time, or they have been impractical. So there is no use in attempting once again in the same way what they have failed to do. That is why I have assumed that a big establishment or factory should take up the idea.

Such a factory is going to look at it from a financial point of view. And that is quite right, because no commercial venture can go on if it costs more than it produces. But I have a very strong feeling that if you give a workman an opportunity of using his faculties, it is going to be a

[1] *Jour. Amer. Ceram. Soc.*, **6** [2], 398 (1923).

wonderful incentive to him, and that, instead of reducing the production, you are going to increase it. I also foresee that it is not going to be at all costly after it once gets going. But to get it going necessarily means expense.

Suppose we have a terra cotta factory for I am thinking of the buildings we see everywhere, faced with glazed or semi-glazed terra cotta. If such a factory tried out this scheme the first thing they would need would be a room set apart with a good light. I do not suppose that would be very expensive. They could find a room with a north light so that the sun would not come in and disturb the effects. Then they would take one or two of their employees who seemed brightest and most interested and make a start. Then I think a very essential thing would be to have a place where the results could be seen and discussed. Therefore, I suggested a little outside wall or courtyard where the pieces could be viewed. I have always liked to put things up at about the height they belonged and to look at them. Sometimes I come to the conclusion that the next thing I do will be slightly different because the effect is not very good; on the other hand, sometimes I am very much pleased with it. So that the opportunity of seeing the work is a very necessary part of this scheme. The factory hand at present never knows what his work looks like. He is not supposed to be interested; but here he would be expected to take an interest. This is an expense.

In regard to materials, I should certainly not introduce any fresh materials to begin with. I should take the clay the factory used. Probably it would be a suitable clay for the work. And whatever it would be, it would have artistic qualities. The point would be to bring out these qualities. Therefore, there would be no extra expense in the matter of the clay. In regard to the firing, this would undoubtedly be the correct one for the clay used so there would be no expense there.

With respect to colors and enamels, I would try to utilize those the factory had. That would be a very essential thing so as not to disturb the business more than necessary. As a rule the number of colors and glazes used is considerable and it is really not a case of increasing the number but, rather, of selecting only a few out of them. So there would be no great expense there.

But there would be other expenses. Somebody has to manage the department, give his whole time and thought to it, and that person has to be paid. And no doubt the results would not be forthcoming immediately. There might be some results at the end of a month or two, but they might not be good enough to be considered worthy of use and it might take several months before you got to a point where you could say, "We are going to put up a façade, or a structure to send to the Architectural League in New York, or some other place, as an exhibit of a finished product we are

proud of." It might take quite a time to reach this point and therefore, it is bound to cost a little money. What this amount is, I cannot tell for there are too many unknown quantities. I have tried to work it out, but I have not been able to get anything definite. But if you want artistic work you have to use the people in a different way from that in which they are being used now, in order to bring out their talent. That latent quality and taste exists among certain people. I do not say everybody has it, but a certain number of people have. That taste is capable of development and it can be brought to a high pitch. You only have to go to Europe, to the places where they do traditional pottery to see some very charming things sometimes at a very small cost. They charm you because there is the human touch there and a sense of proportion. At a place called Mold, in Wales where I went on a walking tour some years ago I came to a little pottery where they made pots and plates and jugs for common use. They had the most charming money boxes with pigeons and other birds on them. These were put there by children and they were most happily arranged. That is due to a natural talent. I am sure that talent exists everywhere, but it has to be brought out again. It has been crushed and it has to be reborn. It has not been absent more than three or four generations; it has to be revived and the conditions under which it can be developed anew have to be considered. This has to be done in the modern factory, because that is the only place at the present moment where such a thing can be done.

Miss M. G. Sheerer:—Mr. Mercer with the Norristown Tile, and Mr. Allen, with the Allenthorp Tile, it seems to me are doing a very similar thing. These are not factories, but they are bringing out the most artistic results and are in no sense commercial. They have made a financial success of it, and if it could be done in that way, I do not see why it could not be introduced into the larger factories.

C. Dressler:—That seems to prove my theory, doesn't it?

Miss M. G. Sheerer:—Yes.

Mrs. G. O. Totten, Jr.:—I think just the same thing has been done in Sweden. I was in charge of this work, producing very good results. The girls I employed were very much interested.

C. Dressler:—That is very satisfactory. Did it create a good feeling?

Mrs. G. O. Totten, Jr.:—A very good feeling, indeed. Afterwards I had to go around and exhibit these things in different cities in Sweden and Denmark and Norway, and that increased the interest still more.

C. Dressler:—These were not buildings?

Mrs. G. O. Totten, Jr.:—No, these were figurines.

C. Dressler:—What is true for figurines and small things would be equally true for large work. I am speaking of the modern buildings.

Mrs. G. O. Totten, Jr.:—I think it could be done.

F. H. RHEAD:—There is one thing to consider; it is one thing to make things in a small way and entirely another to make terra cotta for a forty-story building, involving thousands of tons.

W. D. GATES:—In pottery and with the things cited here, you must remember they kill the imperfect. One good piece comes out, is admired and is handed down, commended; but the bad pieces and the mistakes are broken up. I do not know to what extent Mr. Dressler has investigated the plants that are running today or the methods that are being used but I could not help but think that if he was speaking of trying out the cost of this experiment, he would have to buy a large lot in some one of our cities, and put up a building.

I, too, have dreamed many dreams, and some of them have had sad endings. As a matter of fact, the manufacturer of terra cotta today is absolutely under the control of the architect. We find the architect has a scheme for the entirety of his building, and if you distribute that work among girls and boys to let the individuality of each show itself in the work you would have a hodgepodge in the general result in the building.

I believe in individuality and in the pride of a workman. We have our factory out by itself away from everyone else, much to the horror of many people who cannot consider why we do it. But everyone that goes through that factory says that there is a different atmosphere there from what is found in other places. Someone said to an architect going through recently, "Did you enjoy your trip?" He said, "I should say I did. Everybody met me with a smile, and when I go through some of the other factories I am looking over my shoulder to see if someone is not hitting me with a brick." We do not unduly curb or guide individuality.

The modern building reminds me of a composite picture of a large number of people made by imposing each negative for an instant over a sensitized plate. The construction of one of these large buildings seems to be the composite of all the people engaged in its building, from the mortar mixer clear through. It is a little bit of each man's life, a composite. But it all has to agree with the architects' drawings.

We are kept down, controlled, by the architects and by the owners. Mr. Dressler would have a very hard job justifying the individuality or the carelessness or the conception of the individual workers to the committee in charge of the building or church. Such a justification is absolutely necessary to make collections.

The artistic tendency of the terra cotta man or the potter has but a fleeting reputation. You do not know the potter who made della Robbia ware. Della Robbia was working in bronze and marble, and evidently went to a potter to get clay because he had to model in clay first. They were making enamel which he utilized and today his works are priceless in the best museums in the world. We do not know anything about the

potter. As a matter of fact, there is a glamor that goes with that. Some people consider it a lost art. The potter or the sculptor has a better field to work in today than he had in the time of della Robbia. The della Robbia ware would not stand in this climate. It did not stand exceptionally well four hundred and fifty years ago in the climate of Italy.

I have had this same scheme in our factory, in the modeling room. I have had men who would look at an architect's drawing, and say, "I can give them a better thing than that." That man cannot be employed for though he may make something better in that one individual pattern in the broad scheme of the architect's feeling of what that building will be it will not fit in; the architects have their peculiarities worked into the scheme of the building as a whole.

There is the question of color. For a long time we have had colors and we have tried very many things to bring them to the architects. Many years ago I had Maratta for over a year at the factory, making landscape panels in terra cotta. He painted pleasing ones in water colors. I sent some of these in terra cotta to the Architectural Exhibit in Philadelphia. I was very ambitious, and I thought that by showing a realistic landscape painting in colored enamel the architect would immediately say, "If they can paint a realistic picture in ceramic colors, they can certainly give me anything I need for use in a conventional design." Those panels came back from Philadelphia, thrown into their boxes. I wrote to some friends in New York and got back courteous letters saying their committee for the New York Exhibit had gone to Philadelphia and had looked at these and did not approve of imitation of oil paintings in terra cotta, and then they added, to save me, "You have done so much beautiful work, why can't you send some real work here?" Of course, I became indignant and did not send anything. But that is the way things are looked at.

We have tried to get architects to use colors. They are afraid of them. You can readily see why this is. As you go through the country you see Greek buildings, one after the other. It is a very safe proposition, to take something that has been commended for many generations. You cannot make a mistake. I have had one architect after another worked up to the point of using color, but each time they cut it all out for fear they would make a "botch." It is a dangerous move.

We have tried *individual* work in this way. I think it has to be controlled. Somebody who is running the establishment has to watch the men, to control them and work out something that will be consistent all the way through. If it shows the individuality of any one of the men there is going to be quarreling.

We have gotten the enthusiasm of our men in their work and we have been doing it in this way. The men cannot go to see these buildings because they are very widely scattered, but we get progress photographs

as they go up. We post these on the bulletin board. Each man can say to himself, "There is my work, I did that." But we cultivate the idea among them, not that "I did that," or that "You did that," but that "that building is the collective work of the whole crowd," and their enthusiasm is very earnest. When we get a letter of commendation, as we sometimes do, we post the letter on the bulletin board, and the men feel that they are really accomplishing something that is standing and will stand after they are gone.

The proprietors of the Radisson Hotel in Minneapolis had a cellar they wanted made into a dining room. It was a most desolate looking place and had to be handled very carefully. The ceiling was a suspended ceiling of plaster. There were to be twelve panels around the room, something like twenty-five or thirty feet long and four and a half feet high, and those panels were to have scenes in color from the Upper Mississippi and the Northwest. This thing had to go through the factory in very quick time. That is the thing we are up against all the time. There is no time for experiment. I got Charles Francis Browne, one of the best landscape painters in Chicago, to make small oil paintings of these different scenes. We took these to the factory and reproduced them on five-inch tile set upon an easel the size of the panel, with allowance for shrinkage. They were plastic. We drew the lines of the landscapes in the plastic clay. Then we dried and re-assembled them. Browne selected the colors and tints. You had to know what color you were putting on for when applied they did not exhibit the fired color and tones. We were successful in getting the job through on time and were very much commended.

There are fields of that kind, in which the artist can find opportunity for self expression but there is the imminent haste demanded by commercialism in your payrolls. They are running all the time, and you cannot run very long unless you can make collections.

I think there is a big field for individuality, but this individuality must be restrained, just as our modelers are restrained. We have no particularly lasting reputation. I have been at work forty years putting up these buildings. I go by them and think of the work I went through getting the material there and my part in the erection of the building. The owner or the architect, however, is the one who has the glory, just as della Robbia had the glory. But there is a big reward in feeling that you are making something that is fine. You have to have the enthusiasm of the workman in it or else you do not get a good thing. It has to be controlled, and commercially it has to be controlled by the owner or the architect.

They have a better palette of color now in ceramic ware than ever before. We have had to test each one in our climate. And this American Ceramic Society has played its part in this wonderful work. When I

look at the five-foot library they have built up, I am filled with pride. My pride is none the less because I really had but little to do with it, but I have had the privilege of associating with the men who were doing it.

MAJOR TOTTEN:—I am not a potter, but I feel that the architects are being criticised in some way in which I do not think that they themselves would like. That is to say, I do not think an architect puts himself up as the primary designer of a building. He says, "I am the designer of the main part of this building, but I cannot succeed alone. I cannot make an artistic production, unless I have the coöperation of artists in all the lines that are connected with this building."

The Public Library in Boston is to my mind one of the best architectural buildings in America, and yet it is quite as famous for its paintings as it is for its architecture. And there is no reason why ceramic work, which is coming up with such splendid strides in America, should not produce works which should be signed by the artist and which should stand just as high as any of the work which the architects do.

There is, also, the question about the construction and decoration in architecture. I have had a feeling for colored architecture for many years. I have tried a few simple specimens, and the question of how terra cotta work should be used in architecture is very puzzling. Architects, I think, do not feel they have entirely solved the problem. There is one class of building, like the Woolworth Building, terra cotta building, in which all the architectural parts are in terra cotta. They might just as well be in stone, and the architectural moldings are designed as if in stone, and yet here and there there are patches of polychrome. The other class of building is that done by the Moors and Arabs; they are not structural at all. They are surface decorations, using a real interior surface decoration put on the outside. That was more or less a questionable external architectural effect. Another method is one by which they use terra cotta and ceramic products in connection with other materials. That seems the most logical thing. For instance, the façade which the American Encaustic Tiling Company has done in New York for their own building, I think, is a very rational thing. They have taken an old house and remodeled it. The effect is a combination of materials by using a plain surface for their masses and then enriched their doorways and windows with terra cotta. That seems to me one of the most rational uses of terra cotta.

C. DRESSLER:—I feel encouraged by what has been said by the several speakers.

Mr. Gates has said that the manufacturer of terra cotta is absolutely under the architect. Now this is a point which I deplore and want to see corrected. Mr. Totten, as an architect, looks upon such a statement as a severe criticism of his profession. The architect should not be the only designer of a building; he can only succeed in an artistic work by the co-

operation of artists in all the branches. It is this artistic contribution that it is the evident duty and privilege of the potter to give. Others beside Mr. Totten hold this view. A member of the Architectural League appealed to the potters for a free artistic rendering of their art in the terra cotta they produce, to get away from the stereotyped imitation of stone or granite. I think that most people are now agreed upon this point.

Mr. Gates has said that if the terra cotta work is distributed among boys and girls and the individuality of each is allowed to show itself, one will have a "hodgepodge". I have been careful to say that I would not allow such a freedom to the workers. I have explained that their faculties, now lying dormant, must be awakened and trained to work in harmony and in unison. It is like an orchestra, of which each member has his limited task under the leadership of an able conductor.

Even with a trained band of workers, under capable leadership, it is quite probable that the interpretation of the design of a modern architect might fail to satisfy him. That is why I propose that the results of the coöperation and coördination of the workers, under this leadership, shall first be expended upon independent examples, which would not be ordered but which would be submitted to architects as specimens of their skill. If, shown in a public place, they succeed in pleasing the architects, these will design buildings in conformity with what they know the factory is capable of turning out.

They may have suggestions of modification and improvement; they may even take a friendly hand in the development of the art. That is exactly what we want. But now, there is no original modern pottery work for them to go upon, so they are restricted to sending potters the ordinary stone building blue prints to which the manufacturer has to conform at his peril.

I appreciate that Mr. Gates' factory is conducted in a very liberal spirit, and that the workers are treated with real humanity; also, that they take a corporate pride in the structures in which they have a hand; but, if Mr. Gates will follow me, he will see that it is a quite different interest and stimulus that I am giving to the individual worker. I am glad to have the experience of Mrs. Totten in support of my theory as well as the further confirmation of Miss Sheerer.

Undoubtedly, the delight in the use of creative taste in coöperation is a powerful element making for good in human work. I use the word "creative" advisedly. Every time that the faculties of man are used freely, they are in a measure creative and original, and their employment is a delight.

Why leave it out, when it is there for your service? Mr. Gates says that the man who sees his way to improve upon the architect's design is a dangerous person. But, properly disciplined, he is the most valuable

person in the factory. His talents, of course, cannot be exerted upon work which has already reached the final stage and been blue printed. Use him in the experimental work and what he does will appeal to the very architects who would have every reason to resent his making modifications in their finished plans.

Another thing, which I think Mr. Gates did not apparently quite realize, was why the architects failed to appreciate the reproduction or copying in faience ware of paintings in oil or water color. The fact is that they would not know of the enormous technical difficulties overcome, and of the handicap of our altogether too short space of time to do the work in. They would judge only by results.

Copies never are satisfactory. That has been proved over and over again. It seems like a law of nature and I believe it to be a beneficial law. It makes necessary the use of the creative faculties whenever anything really beautiful is aimed to be done. A good oil painting we know gives great pleasure; done with pottery or tapestry, it loses its charm.

I do not know whether Luca della Robbia fired his own pieces. I fancy he did, with the assistance of his nephew, Giovanni. I am glad he was mentioned, for I should like to see the potter receive the credit for his work, and a beautiful building be ascribed to him, no less than to the architect who supplied him with his opportunity.

What I am advocating is now desired by many thoughtful people. It is bound to come about, sooner or later. Let me repeat that it is not really a very expensive experiment, because it will have the hearty coöperation of the workers, and because as soon as good results begin to appear they will gain favor with the architects and the general public. The potter, who has the vision and the courage to make a start along these lines, will lead in this great and important field, and gain his reward. I hope that Mr. Gates will be that potter.

DISCUSSION ON "THE MECHANICAL STRENGTH OF GLAZING GLASS"[1]

Chairman Hostetter:—This interesting problem on the tensile strength of glass is open for discussion.

J. H. Forsythe:—I think the work should be carried on as he pointed out.

A. E. Williams:—The results shown we thought were pretty consistent for the rough rolled and wire glass, in which we tested five days glass at

[1] A. E. Williams, *Jour. Amer. Ceram. Soc.*, **6** [10], 981 (1923). Received too late to page with original paper.

the same factory. We showed a variation for one day, a modulus within ten per cent. That is not the maximum: that is the average variation from the average volume.

Now, for the thinner glass the variations ran greater than that and in some cases as high as twenty per cent. I have a few figures here. The maximum average for any one day of about twenty days' production at the factories, the modulus was 8600 maximum and 5500 minimum. That minimum is for rough rolled glass. For ribbed glass the maximum was 5700 and the minimum was 4600. For plain rough wire glass the maximum was 7900 and the minimum 5600. That represented different factories.

For ribbed rolled wire glass the maximum was 7300 and minimum 6200.

For corrugated wire glass the maximum was 17000 and the minimum 12900.

For $^3/_4$-inch deep corrugation, the maximum was 10,000 and the minimum 9100.

For polished plate the maximum was 6900 and the minimum 6000.

For unshatterable glass the maximum was 9500 and the minimum 6700. There was quite a variation.

On the clear sheet glass we got the greatest variation. The maximum was 12,700 and the minimum 6000.

I have also taken an average for these various types of glass which you might recommend for up to date engineering practice in figuring strength for construction purposes:

Single and double strength, or 26 ounce	7000
Heavier sheet glass and quarter-inch plate	6500
Rolled sheet and wire glass	6500
Ribbed rolled sheet or ribbed wire glass	5300
Corrugated glass	13,500 and 9500

SULPHURING OF GLASSES[1]

By J. C. Hostetter

J. C. Hostetter:—I suggested this title to find out something from the discussion. Apparently sulphuring may be the result of several causes, one predominating at one time, and another at another time under some other conditions. Sometimes it takes place in the working of the glass, sometimes in the leers. I should like to see the situation reviewed and perhaps some conclusions reached.

Mr. Ford explained that they have not attempted to study this feature, but have simply studied the effect of moisture on the glass. That when

[1] Glass Division, Pittsburgh Meeting, Feb., 1923.

a rubber stopper was used the surface was more clear than when using a cork stopper.

Mr. G. V. McCauley stated that some time ago his plant had had trouble with bulbs which came back with a white formation on the inside and outside. He further stated that a half dozen men at his plant got together for the purpose of ascertaining where this came from, and that after a little investigation they traced it, as they thought, to the glue used for putting the two outside papers on the corrugated padding; that it comes out and affects the glass when this glue is moistened by water, steam, or the like.

Mr. A. Silverman stated that the silicic acids were very weak and that possibly the organic acids might be stronger than the silicic acids, which would account for the reaction.

R. R. Shively remarked that he had had experience with sulphuring of jars in leers, but that this deposit seemed to form as the jars cooled, as those taken out of the hot part of the leers did not show the deposit.

Chairman Hostetter:—Your statement is that an extreme oxidizing condition is desirable in your particular case.

The paper that appeared in the *Journal of the Society of Glass Technology* a year or two ago indicated that a reducing atmosphere for light glass was desirable, thus going back to the idea of having charcoal in the glory hole, all the time. The rings you describe on the jars: did they appear immediately as they were taken from the leer or glory hole?

R. R. Shively:—From the leer, and they were not heavy.

Chairman Hostetter:—I have seen this phenomenon. As the ware was taken from the glory hole it would show signs of surface discoloration. They could be washed however. The lines would show up under the action of water.

R. R. Shively:—I have noticed a ring formed on the ware warmed in a glory hole fired with gas containing sulphur. This was eliminated by running an oxidizing flame. After washing this ware, these rings were more pronounced.

DISCUSSION ON "A STUDY OF THE ORIGIN AND CAUSE OF STONES IN GLASS"[1]

A Member:—Is it possible to add material which may cause the glass to boil in the melting end of the tank and may tend to keep the scum down or remove it after it is once formed?

H. E. Insley:—Any action which would bring materials of higher specific gravity to the surface would probably remove the scum. The addition of salt cake to the melt might also remove the scum.

[1] H. E. Insley, *Jour. Amer. Ceram. Soc.*, **6** [6], 706 (1923).

R. J. Montgomery:—We often had white surface scum, but we have cleared this up. We broke up that surface. We have been able to improve the quality immensely by stirring.

A. E. Williams:—What are the different ways in which corundum may be formed in the glass furnace?

H. E. Insley:—In the case of the formation of corundum on clay blocks above the glass surface, there must be excess of alumina. After the absorption of soda from the furnace atmosphere and the formation of the sodium aluminum silicate which is liquid at furnace temperatures, the excess of alumina will crystallize as corundum. In the case of the formation of corundum in flint glass not exposed to the soda in the furnace atmosphere, there is often direct conversion of the dehydrated gibbsite or diaspore to corundum.

H. W. Hess:—Some years ago, not being very familiar with this type of work and hunting for the causes of stone in heavy glass, I had to seek aid from the outside. We took an ordinary pot holding about three thousand pounds of glass and introduced fragments of pot clay of various sizes and closed up the pot, and after two days I took out samples and examined them and then compared them with stones that they had found in glass in process of manufacture. We closed the pot up again for several days and kept that procedure up, just holding this one pot for that type of work until the stones gradually disappeared, and we found a long line of threads where the crystals were carried away by movements of the glass although the inner structure had entirely disappeared. Experimenting along that line, as regards stirring, while stirring the entire crystal structure disappeared. Some of these experiments were carried over four weeks, and I have wondered whether such work was being done. That gave me a great deal of information that I had not been able to gain otherwise.

H. E. Insley:—That is the kind of work we want to do at the Bureau later. So far we just have examined stones sent into us. We would be glad to examine any forms of crystalline material sent in to us. We are very anxious to have samples of any kind of stones.

M. G. Babcock:[1]—The writer has seen several samples of stony glass which appeared on first analysis to be clay pot stones. In the particular factory where this occurred, they were melting a fairly heavy lead potash glass batch in covered pots. A part of the K_2O in the batch was obtained by substituting some niter in place of all potash. Instances were noted on several occasions when the pot planed up and the stopper removed, that the gathered metal was full of small stones, making the pot unfit to work. However, by stoppering the pot for another twenty-four hours, the stones disappeared. On first inspection, this type of stone had all the earmarks of a clay pot stone, but the very fact that on the second day it had dis-

[1] Written discussion received April 20, 1923.

appeared, proved to the writer beyond all question that these stones were not from the pot but were batch stones.

In many factories clay pot stones are made more numerous and objectionable by the rather common practice of scraping pots. It has been the writer's experience to note that pots which were scraped on Saturday afternoon and were opened up on the following Monday for working the glass, invariably would be stony. The reason for this condition being that the bottom of the pot is cooler and the glass in this region is more viscous, thereby keeping small clay points from the gathering pipe. But should one stir up this metal by scraping, the viscous glass would pull off many protruding particles of the eroded pot and hence many minute refractory pieces would become a part of the next melt, thereby forming numerous stones, these stones becoming evident as the glass is gathered for presser or blower. This condition exists mainly in pots that have been in use for some time.

The subject of pot stones is one which is most important both to the glass manufacturer and the maker of pots. It is a recognized fact that at this writing the pot maker has been unable to find clays or combinations of clays which will entirely eliminate all of the stony glass problems coming from the pots themselves. On the other hand the user of pots may decrease his stony glass troubles by closely watching the effect of his batch materials, the burning of his pots to a high temperature before glazing, and, by being most conservative in following the practice scraping pots.

DISCUSSION ON "SILICA CEMENT"[1]

F. A. Harvey:—Mr. McGee's paper brings out in a very clear manner the importance of silica cement. Comparatively few users pay any attention to the quality of silica cement as long as the boss mason is satisfied and he usually wants a smooth working cement and asks for nothing more.

I should like to emphasize Mr. McGee's point that the softening temperature or fusion point is very easily and quickly determined by the A. S. T. M. standard method. Also it gives much more reliable results than chemical analysis. Alkalies have much greater effect in lowering the fusion point than does a change of one or two per cent in the alumina content. A decrease in the lime content by using raw rock instead of bats will raise the fusion point several cones.

Chemical analysis is of no value whatever unless the total fluxes are considered and even then it has no purpose except to control the fusion point. So why not make this test in the first place.

[1] E. N. McGee, *Jour. Amer. Ceram. Soc.*, **6** [8], 896 (1923).

The per cent of clay is quickly determined by finding the per cent weight lost and heating the cement to red heat and comparing it with the per cent weight lost by a sample of the raw clay used in the mixture after heating. This method is much more rapid than the chemical analysis and just as reliable.

It is doubtful whether there is any advantage gained in trying to balance the shrinkage of the clay by the expansion of raw rock. The real advantage gained by using rock is the higher fusion point.

DISCUSSION ON "MOLD SHOP PRACTICE"[1]

W. D. Gates (Acting Chairman):—The departure from the old method of secrecy as shown by Mr. Klinefelter is an excellent point in his paper.

Secretary Clare:—Mr. Klinefelter made the statement, that it is cheaper to throw up a mold than it is to cast it. We find that casting gives a much more solid mold, more fool-proof, and it lasts longer. I do not know but what it is about as cheap.

There is also a question of making a cast mold for plaster pieces. That is quite expensive. We should have to consider there whether it would pay even to make a piece mold although I think it would.

The paper on the Miter Cutter Department is the first instance of a paper of this type. That is rather a neglected department and one where a lot of unnecessary money is spent. In most cases in the Miter Cutter Department they do as Mr. Klinefelter says: "They stick a soft piece on to a hard piece and they get unequal shrinkage resulting in a crack, or too hard finish." My plea has been to reduce cutter material to a minimum, except where it is too costly.

I think it is a very crude practice to work on pieces in a semi-shrunk condition. We do not know just how much shrinkage it has had, sometimes it has been pressed four hours, sometimes 10 hours, and sometimes 2 days. This shows that this department could bear much thought and investigation. I have been able to pick out miter cutter pieces on a building by just looking at the take-up.

T. A. Klinefelter:—On piecework one mold maker can usually take care of four to six pressers week in and week out without a bit of difficulty.

Ernest Clark:—I have discovered that cast molds stand up. I had a continual run of molds coming back from the pressing shop and I decided that the best was the cast mold.

On a double-ended miter we put what we ordinarily know as sides on first, then the two ends and you would be surprised what difference it

[1] T. A. Klinefelter and F. C. Parsons, *Jour. Amer. Ceram. Soc.*, **6** [7], 783, 786 (1923).

makes. We did have some trouble on account of the depth and a few years ago we used to try to save as much ending as possible.

We made a rabbet all the way from 1/2 to 3/4-inch and that caused the cracking which you mentioned. We reduced that rabbet to 1/4-inch for a cornice piece and have not seen a cracked piece from that time on. It eliminated all the trouble.

A man who is practiced in throwing up a mold can throw it up quicker than he can put up parts, but the plaster mold loses its strength. I believe that the cast mold is the most substantial and the cheaper mold in the long run, especially on big jobs where there are many runs on the same mold.

We have very little trouble with our miters, but invariably if you do not have plenty of room to reinforce the corner it is going to use itself up because in the drying there is not enough clay there to hold the pieces together and it will invariably crack.

I think that in everything Mr. Klinefelter has shown there is good. We have tried to follow that practice right along and our men have gradually got into that way of working and we have very little trouble. The mixing of the plaster has a great deal to do with it.

Chairman A. F. Hottinger:—We have all grown accustomed to these big rabbets. It seems to be very nice providing space for an amount of mortar between the two pieces of sufficient thickness that it will make a strong structure. But as a matter of fact this is all lost in the setting of the terra cotta. The rabbet weakens the face of the piece and no mortar of any consequence is put in, the rabbet not being filled. Any expansion or contraction (contraction particularly) brings a strain. Of course, the depth of the rabbet is of advantage where you have to grind the piece but you will have to grind no more off the piece if the rabbet is more shallow.

DISCUSSION ON "TRANSPARENT ENAMELS"

Led By Thomas A. Wry

T. A. Wry:—I should like to obtain a highly-polished steel surface and have on that surface an enamel that will not impair the reflecting-power of the surface and will withstand weathering conditions.

R. R. Danielson:—During the war the Government was interested in a large reflector that would not be affected if hit by a bullet. We attempted to enamel silver at that time and attempted to get the same results as you did by forming a polished silver surface. We were not able to get what we were after. The coating of glass on the silver surface cut down the brilliancy. I am inclined to think it is impractical to do it.

R. D. Landrum:—I understand in Europe there is such an enamel on

steel. We all have gotten certain glazes that would adhere to the steel and show the steel through.

H. F. STALEY:—It is a difficult proposition. In order to have the enamel stick to the steel you must use a ground coat which tends to dissolve the surface with more or less corrosion whereas in order to get a mirror-like effect you have to have a highly polished surface. In other materials, for instance, in gold, they do that. You can see the material right through the enamel. Perhaps Mr. Wry could solve the problem by trying some other material. All transparent enamels on steel which I have attempted to burn have turned more or less black.

DISCUSSION ON "ZIRCONIA IN ENAMELS"[1]

A MEMBER:—Was that commercial zirconium?

W. F. WENNING:—In the white enamels tests we used pure zirconium and not commercial zirconium.

H. C. ARNOLD:—How did the substitution of zirconium oxide for tin oxide affect the fusibility?

W. F. WENNING:—The fusibility was increased.

H. C. ARNOLD:—Did you get greater acid resistance when the zirconium was added in the mill, in the batch, or both?

W. F. WENNING:—The greater resistance was noted particularly in the batch additions.

H. C. ARNOLD:—That checks our experience. When added on the mill the resistance depended more on the resistance of the gloss.

E. P. POSTE:—What did you mean by higher fusibility?

W. F. WENNING:—Increased refractoriness.

W. J. VOLLRATH:—How did a small quantity affect it?

W. F. WENNING:—It went from one up to 10%, and the fusing point was not affected in batch replacements.

H. F. STALEY:—You said the objection to zirconium oxide was the high price. Is the price prohibitive?

W. F. WENNING:—Yes. The price prevents it being used in commercial enamels.

H. F. STALEY:—How cheap can pure zirconium oxide be produced at the present time?

F. R. Glenner:—I do not think we are quite in a position to state what the exact price would be at the present time, but we are working on the problem and we think we shall in a short time be able to produce material analyzing over 99% in purity at a price very close to that of tin oxide. Our present production leads to this conclusion. This is of great importance to enamelers.

[1] W. F. Wenning, *Bull. Amer. Ceram. Soc.*, **2** [5], 102 (1923).

W. F. WENNING:—Have you any idea what pure zirconia sells for now?

F. R. GLENNER:—We are able to produce it now at a price close to seventy cents per pound but, as previously stated, it will have to be about equal to the price of tin oxide at the present time, if it is to compete with the latter, as it replaces it pound for pound. That seems to be brought out in Mr. Danielson's report. We feel thoroughly confident of bringing down our cost with increased production to enable the enameler to replace tin oxide with zirconia.

B. A. RICE:—How did you test the elasticity of the enamel?

W. F. WENNING:—We enameled pieces of sheet metal twenty gage, 3 inches by 5 inches. They were bent over a specially devised jig. Enamels that would crack while bending through small angles were considered to have low elasticity, while those enamels which could be bent through greater angles were considered to have greater elasticity or stronger.

B. A. RICE:—How were they bent?

W. F. WENNING:—By hand. The adhesion in turn was tested in a similar way. Those enamels which jumped off the iron while being bended were considered to have poor adhesive qualities.

F. J. JAEGER:—Do you not get an entirely different result in the bending according to the quantity of enamel applied?

W. F. WENNING:—We applied a uniform quantity on all tests. We were aware of the fact that various thicknesses would vary the results. We used only one coat in most tests.

J. A. AUPPERLE:—Did you test out the zirconium enamel for acid resistance?

W. F. WENNING:—We compared the acid action on the zirconium enamels to acid action on other enamels relatively.

M. E. MANSON:—I had samples of two different concerns. Each said they had zirconium oxide, but they really had zirconium hydrate. Was your material zirconium oxide or zirconium hydrate?

W. F. WENNING:—We used pure zirconium oxide.

F. R. GLENNER:—It would be quite enlightening in the application of zirconium oxide if Mr. Danielson would follow up his tests with data showing the success of pure ZrO_2. I should judge that the closer you get to 100% purity, the better would be the results in the enamel. It would be interesting to see how that worked out in practice.

R. R. DANIELSON:—The tests were made some time ago when it was difficult to obtain the pure zirconium oxide.

H. C. ARNOLD:—In literature I have seen a number of references made to basic zirconium silicate, especially in foreign literature. I wonder if any one has had any experience in using basic zirconium silicate.

L. J. MUNROE:—I had some experience, but it was not of a pure grade.

Any man almost can use tin oxide with safety. Zirconium seems to take more technical skill. My experience shows that I had to be more careful in burning than was the case in tin oxide. But I am not present to say what can be done with zirconium.

A MEMBER:—There is one point I do not understand. Why does zirconium oxide have to be so pure? Why could we not use the ore and take out the materials that would cause discoloration and have for use about 85% zirconium oxide?

L. J. MUNROE:—At the smelters that could perhaps be done, but in the enamel plant I do not believe that it would be practical.

F. R. GLENNER:—Has Mr. Danielson data on titanium in connection with zirconium oxide? Perhaps even a small percentage of titanium would affect the results.

R. D. LANDRUM:—There is very little data on the subject and I think it would be well if some of the committee would work with it and give us their results.

Every ounce of tin oxide we add makes it less enamel, for the tin does not go into solution. The few results that we have obtained with zirconia shows that though it may be an opacifier it also increases corrosion resistance. It is a point to be considered and upon which somebody should spend considerable research.

DISCUSSION ON "RELATIVE MAGNITUDE OF RADIATION AND CONVECTION IN A MUFFLE KILN"[1]

W. ROSENHAIN:—I am inclined to suggest, tentatively, that it would be desirable to be a little cautious in accepting the author's generalization because convection is not a constant thing; it depends upon the particular circulation of gas you have in your furnace. The amount of heat which the surface can absorb by convection is a function of several, one of which is the velocity at which the gas is moving, consequently it all depends where you place a cylinder like that as to how much heat it will absorb and what radiation you get. These figures are very interesting, yet I am not at all certain we will be safe in applying it equally.

In regard to the temperature of the water inside the cylinder, he tells by the amount of heat communicated to this how many calories per second are passing through the copper. I never worked this out, but there must be a difference of several degrees between the outside and inside. Certainly there is room for correction there.

J. T. LITTLETON:—Dr. Rosenhain's point in regard to the variation of convection in different forms of kilns and so forth is very true. I attempted

[1] J. T. Littleton, *Jour. Amer. Ceram. Soc.*, **2** [7], 771 (1923).

to bring that out in my statement. These data would only apply to this one particular kiln. The point of position of the surface subjected to convection heating, of course, is extremely important. In this case it was somewhere near the center of volume of the kiln, at a place where it was subject to a good average condition. The temperature gradient through the copper vessel was much less than 1 °C. However, as was pointed out the error would be negligible so far as radiation is concerned had it been ten degrees.

DISCUSSION ON "THE FLINT CLAY SITUATION IN PENNSYLVANIA"[1]

A Member:—Is it agreed that the quarry rock is better than the ledge rock for ganister?

R. W. Stone:—Last summer I tried to cover as much of the state as possible. In 2400 miles, I saw no place where rock was being quarried for use as ganister. It was in every case the talus. That may simply be an economic proposition. It is easier to pick it up than to quarry it by the use of expensive explosives. The outcrop has been subjected to weathering sufficiently so that the soluble material has been extracted. There is little left but the silica and it is freer from iron.

Chairman J. S. McDowell:—In our own experience in the quarrying of quartzite in Pennsylvania, I think it is true that the talus rock is almost invariably purer than from the solid measure, although there is a great deal of solid measure rock of high purity.

A. F. Greaves-Walker:—If that is the case, will not the talus rock be exhausted and the silica reduced to disappearing point within the next few years?

J. S. McDowell:—I do not think so. There is sufficient talus to keep the brick works going for a long period of time and there are a good many of the solid measure deposits which are extremely pure. They probably will not be worked to any extent as long as the talus is as abundant and readily available as it is now.

R. W. Stone:—It seems that the talus in the immediate vicinity of Mt. Union, Pa., is rapidly being exhausted, but the formation, the Medina, outcrops all the way from the southern to the northern boundary of Pennsylvania, loops back and forth and repeats itself, and for a hundred miles the talus lies below the outcrop. I was particularly impressed by the great rock slides along the mountain-ridge with talus the whole length. Very little of this is at present time accessible to railroads. It means the building of tram roads to get to it. There is an enormous quantity

[1] G. H. Ashley, *Jour. Amer. Ceram. Soc.*, **6** [7], 837–49 (1923).

of talus of the highest grade to be obtained that will last the refractory industry of this state for many years.

F. A. HARVEY:—My own company and at least two others are using a large proportion of solid measure rock and have been for several years. We produce a very successful brick. As to the purity of the material, the best analysis which we have ever had, came entirely from solid measure rock. An analysis showed iron about $^7/_{16}$ of one per cent, and alumina considerably under one per cent. The greatest difficulty we find is that the solid measure rock is so hard that it wears the pan castings too fast in grinding. It is our ordinary practice to mix the talus with it to be able to grind the rock easier.

A MEMBER:—How much lime?

F. A. HARVEY:—There is about $^2/_{10}$ of one per cent.

H. INSLEY:—Do any of the flint clays of Pennsylvania contain diaspore nodules?

F. A. HARVEY:—Some of them do.

J. S. MCDOWELL:—How long are the flint clay deposits going to last?

R. W. STONE:—It is the impression that the deposits are comparatively scarce and it will not be many years until they will be much more valuable than they are now.

J. S. MCDOWELL:—Can you give us any data?

R. W. STONE:—The personal opinion of Dr. Ashley is that there are considerable sections of the bituminous coal measures and he is firmly convinced that there is a sufficient quantity of the flint clay and of the soft clay to supply the industries of this State for a good many years, which is a little bit more than the "many" he used for the talus. He has no fear that the producers in this state will be obliged to go outside of its boundaries for its refractory materials for a considerable time to come.

DISCUSSION ON "NOTES ON BURNING REFRACTORIES WITH SPECIAL REFERENCE TO CONTROL OF LABOR COSTS"

E. H. VAN SCHOICK:—How long has this system been in operation?

L. C. HEWITT:—Four or five years.

MR. ALLEN:—Mr. Hewitt, in your work did you find that a bonus system was sufficient incentive to get the men to be interested in it?

L. C. HEWITT:—Yes, but we had some trouble getting the thing over. We had actually to show the firemen that they could easily do the work with fewer men—the added earnings did the rest.

MR. ALLEN:—We put the bonus system in our plant. We made a time study and found they were running, on an average, 50% efficient of what

[1] L. C. Hewitt, *Bull. Amer. Ceram. Soc.*, 2 [5], 109 (1923).

they could do and made that a basis of pay and found that by offering an inducement of $37^{1}/_{2}\%$ increase in pay for 60% increase in production they could go right after it. That is, for each 2% increase of production above fifty, the men would make one cent per hour more. Anybody on that basis could make some money. They found they could get a little bonus and do a little more work. We have had them get 80% on that basis. It has been particularly successful in hand molding and finishing. In some of the other operations where you have variable conditions like wheeling in clay when the clay is frozen, we have to change our rates to allow for that and it is rather questionable in that particular case. Of course, we have to allow for breakdowns in machinery. The men are not responsible for that. There is also a tremendous amount of work involved in this kind of thing and while it does speed up production, it remains to be seen whether it actually pays.

L. C. HEWITT:—It pays well in our particular instance.

E. H. VAN SCHOICK:—Have you had any experience with men who did not earn any bonus; men who were earning the bonus right along and for some reason, possibly not their own fault, they did not make it for one week.

L. C. HEWITT:—Yes. We went through a very heavy rain—almost amounting to a flood—necessitating extra labor far above normal. You have to allow for a condition of that kind.

E. H. VAN SCHOICK:—Where the men have been earning the bonus for any length of time, they come to think of that as their wage. If they do not earn the bonus, they have the idea that the company is cutting their wage and it is troublesome.

E. E. AYARS:—Do I understand, Mr. Hewitt, that you make allowance for abnormal conditions or force the men to make allowance?

L. C. HEWITT:—We allow for them—but allowances that are necessary are surprisingly few. The regular fatigue allowance takes care of many little things that come up. When some big abnormal condition arises, conditions are changed and you have to change your basis. We do not change the bonus system as long as the conditions remain as they were at the time the system was established, no matter how much the men make by increasing their efficiency. Increased earnings for the men means increased earnings for the Company. If the men desire to exert themselves above normal to earn bigger money, they need have no fear that the bonus will be cut, as is often the case in piece rates when a company decides that the rates are too high when the men go after higher wages in earnest. With the bonus system, a man can earn good money by doing a fair day's work. If he feels like going beyond that he can. The man who does more work will get more money.

A. HAYES:—Do you make any allowance for the variation in the time

of firing a kiln where they have from kiln to kiln a different type of ware, large slabs, pieces of heavy cross sections, etc.

L. C. HEWITT:—No, as explained in the outline, we have, in this particular example, four definite temperature ranges, 0–500°, 500°–1150°, 1150°–1400°, and 1400° to finish of burn. The standard man hours per shift for firing a kiln while it is in a particular stage is constant. Assuming that the standard is two-man hours per 12-hour shift for the range 0–500° and it takes 24 hours to take the kiln through this period, the standard would be 4 man hours. Likewise if on account of heavy pieces as you mention it was found necessary to take 48 hours in bringing the kiln up to 500° the standard would be eight man hours (4 times the constant standard for this range of two man hours per 12 hour-shift).

DISCUSSION ON "THE SLAG TEST" AND "THE ACTION OF SLAG UPON SILICA, MAGNESITE, CHROME, DIASPORE AND FIRE CLAY REFRACTORIES"[1]

R. F. FERGUSON:—The present slag test is a measurement primarily of penetration and the result of chemical action is largely obscure and very little information is obtainable except a measurement of the absorption of the brick. We hope to be able to develop a slag test which would measure the chemical action and eventually give practical information which would make it possible to predict beforehand the chemical action of a given slag on any refractories and we think we have at least partly accomplished this. The theory on which the test is based is simply this. When refractories are heated, compounds are formed with a low fusion point, and the extent to which this is lowered is taken to indicate the action of the slag on the brick. That is what happens in practice. The brick and slag in contact form a low melting compound, fuse and scour away. The method of procedure is simple enough. The refractories were ground until they were all of the same degree of fineness. In this case, it happened to be 80-mesh. The slags were finely ground and were mixed with the refractories. We mixed up batches of various kinds, with no slag, 4% slag, 8% slag, 16, 30, 40, and 50% slag. We investigated five different types of slag. These slags were brought in contact in these proportions which I have mentioned, with eight different kinds of refractories. Five different types of fire-clay brick, having a wide range of composition, were used. All the bricks selected were considered first quality bricks for the particular type of service for which they were used. The results are very encouraging. I have only picked out a few very representative results with which I will give you an idea of what the test will do.

[1] R. M. Howe, S. M. Phelps, and R. F. Ferguson, *Jour. Amer. Ceram. Soc.*, **6** [4], 589 (1923).

These tests, you notice, will agree with service conditions in three important respects. The fusion point depends upon the amount of slag present. Different slags behave differently with different refractories. With a given refractory, the action of the various slags is comparable. Also, with different slags, different refractories give different values. Consequently, with these three things in mind, we believe that the use of the test is justified, and that further study will give a great deal of valuable information on the effect of slag on refractories.

A. KRUSEN:—I should like to know what alumina content you would consider a diaspore brick. As I understood, that brick contained approximately 60% alumina and I wondered if that was a true diaspore or if a true diaspore would contain more than that amount.

L. C. HEWITT:—It might be stated that any brick which shows a predominance of diaspore crystals can rightfully be termed a diaspore brick. In Mr. Howe's discussion at St. Louis a year ago, it was also developed that we might expect a considerable range in the alumina content of various diaspores. The diaspore brick may also be made either from straight diaspore or from a combination of diaspore and bond clays.

E. N. MCGEE:—We made an investigation at Syracuse on the effect of lime at the fusion point and we ran across this thing that Mr. Ferguson has explained. With silica brick, the addition of lime did not decrease the refractoriness very much. Five per cent lime would decrease the refractoriness to about cone 28, while with clay, the ordinary fusion point would be about cone 12 or 13. I wondered at first what the reason for that was because if you take a brick and place it in the furnace, place lime on the brick and heat to 1350°, the lime will fuse right on the brick and all disappear.

ACTIVITIES OF THE SOCIETY

PRESIDENT'S PAGE

A CALL TO ACTIVITY

By President A. F. Greaves-Walker

An intensive effort to increase the membership is under way. Every Society officer, Section and Division officer, every committeeman and every member is asked to put his "shoulder to the wheel" and make this the greatest drive in the history of the Society. It is surprising how many there are who will join the Society if invited. So many of these are under the impression that they are not eligible.

A Michigan Section has been formed and started off auspiciously by acting as host to those attending the Summer Meeting. This Section is in the hands of some of the strongest and most enthusiastic members of the Society and its success is assured. The best wishes of the entire membership go with it.

Two Pacific Coast sections now seem assured, probably centering around Los Angeles and Seattle. There is a wonderful opportunity for local Sections on the Coast, especially as the members out there are so far removed from the center of activities that they must in a measure furnish their own contacts in order to derive the greatest benefit from the Society. The holding of the next Summer Meeting on the Coast will do much towards speeding up the necessary preliminaries to organization.

With the Summer Meeting over we begin to look forward to our Fall Meeting at the Chemical Show in New York in September. The success of this meeting is assured and it is expected that Ceramic Day, Sept. 19th will show the largest attendance in the history of this annual affair. The Committee on Papers and Programs are preparing an excellent program which will soon be announced.

WHY IS A CERAMIC SOCIETY?

By R. F. Ferguson

"Why is a policeman?" used to be a favorite conundrum in the days before the red tag system was invented. And we have just as much right to ask, "Why is a Ceramic Society?" We all know there *is* one, especially those of us who serve as officers and committeemen. But does it have any excuse for existing? Organizations have been known which were created because "there ought to be one." Does our Society come in this class? Do we get anything for our seven-fifty besides a card and a *Journal?* And those who have been selected or elected to keep the mails filled with blue tinted letters, are they the "goats" or do they derive a benefit from it other than typewriters' cramp and the reward Virtue is supposed to bestow? To answer these questions we must delve into the realms of psychology, a risky thing for a ceramist to do, undoubtedly.

Professor William James divides the self into three parts respectively: the material self, the social self, and the spiritual self. Furthermore, he claims that "a man has as many social selves as there are individuals who recognize him and carry an image of him in their minds." But these individuals naturally fall into groups and to each of these groups we show a different self. The Ceramic Society is such a group and one of its purposes is to develop our professional selves. And this professional self *must* be de-

veloped in most of us if ceramics is to be a life work and not a dreary way of making a living.

To the big boss I am one of the help; a doubtful bargain on the part of the payroll department; a necessary evil that must be added to the bug-a-boo overhead because not directly in line with production. To my neighbors I am a poor ass who wont buy his family a car; a good-hearted sucker who works hard for what he gets, and who doesn't know when his hair needs cutting and his trousers need pressing. If these were the only Mes I had to live with, I would find myself poor company. The African explorer, world traveller, and heavy weight champion who used to tell me they would be waiting for me when I grew up are not to be found. The man my mother thinks I am has gotten too far away to be recognized.

But, now, in comes another Me. It is the image that the fellow members of the American Ceramic Society, present and future, carry in their minds and it brings much satisfaction, inspiration, and encouragement. It is a wonderful Me, of a delicate blue tint, with a copy of the *Journal* under each arm. An ardent searcher for truth who wishes nothing better than to uncover some obscure fact whereon other workers may build and which abstractors can tuck away in a card index. A Me whose name is already in that pantheon of our student days, the authors of the technical literature; an expert who knows the haunts of molecules and whose opinion is to be sought; an *ipse dixit* to the young student; a professional man who hews unflinchingly to the dead log of error and lets the stockholders dodge the chips. And this is the Me that takes the labor out of laboratory, the burning bush that makes my study holy ground. And this particular social self, this baby-blue Me, would not be possible without the American Ceramic Society.

NEW MEMBERS RECEIVED FROM JULY 16 TO AUGUST 15

Personal

E. B. Baker, 764 Military Ave., Detroit, Mich. (Star Grinding Wheel Co.)

W. H. Ball, Ball Bros., Muncie, Ind. (Ass't. Gen'l. Manager.)

Ellridge J. Casselman, University Club, Pittsburgh, Pa. (Industrial Fellow, Mellon Institute of Industrial Research.)

Leon B. Coffin, 310 Cayuga St., Syracuse, N. Y. (Onondaga Pottery.)

Thos. R. Davison, 187 Jennings Ave., Salem, Ohio. (The Salem China Co., Supt.)

Eldon B. Flu, % Champion Porcelain Co., Detroit, Michigan. (Chemist.)

Jno. M. Gibson, 120 North Park St., Edgewood, Wheeling, W. Va. (Foreman.)

W. S. Hamilton, Celito Products Co., Lompoc, Cal. (Sup't C—22 Brick Plant.)

F. Heinrich, Eisen & Stahlwerk Hoesch, Forschungsanstalt, Dortmund, Germany. (Director of the research dep't. of the Hoesch Iron & Steel Works.)

Everett Curtis Hunting, 326 Clark St., Olean, N. Y. (Student N. Y. State School of Ceramics.)

Fred P. Johnson, 335 W. Ave. 26, Los Angeles, Cal. (Stone Ware, Foreman.)

Oscar W. Kraft, 3350 Scotten Ave., Detroit, Michigan. (Ass't Superintendent.)

Cyril Kussman, % Favorite Stove & Range Co., Piqua, Ohio. (Foreman.)

Irving B. Laud, 70 W. Boylston St., Worcester, Mass. (Norton Company.)

Otto Oscar Malleis, 333 Melwood St., Pittsburgh, Pa. (Ass't Chief Chemist.)

G. H. Morton, % Los Angeles Pressed Brick Co., Alberhill, Cal. (Clay Mining Contractor.)

Andrew N. Outzen, % Detroit City Gas Co., Detroit, Mich. (Field Sup't Coast Sta. "J.")

Samuel Peacock, Suite 405 Wheeling Steel Corporation Bldg., Wheeling, W. Va. (Iron and Steel Technical Counsel.)

Edgar C. Rack, 26 Elizabeth Ave., Newark, N. J. (Engineer Gen. Insulation & Power Specialty Department.)

G. Ross, Saltillo Mexiko, Apartado 136. (General Manager.)

E. Roth, Zehren b/Meissen in Sachsen, Germany. (General Manager.)

Fred W. Runge, 23 Oxford St., Rochester, N. Y. (Chemist.)

Henry Holder Stephenson, 181 Jeanne Mance St., Montreal, Que., Canada. (Ceramic Chemist.)

C. S. Tietsworth, Celite Products Co., Lompoc, Cal. (Research Chemist.)

Ferdinand S. Van Doren, East Millstone, New Jersey. (Ass't Ceramist.)

O. C. Wahl, 622 S. Park Ave. (President and General Manager.)

Andres T. White, 34 Penn. Ave., Dover, N. J. (Foreman, Enameling Department.)

CORPORATION

Carr Lowrey Glass Co., Baltimore, Md. Carl G. Hilgenbery, Pres.

Dover Fire Brick Co., Cleveland, Ohio. F. C. Preston, Vice-Pres.

Fostoria Glass Co., Moundsville, West Virginia. Wm. F. Dalzell, Chemist.

Pangborn Corporation, Sand-Blast and Allied Equipment, Hagerstown, Md. Thomas W. Pangborn, Pres.

The Titanium Alloy Mfg. Co., Niagara Falls, N. Y. Andrew Thompson, Vice-Pres.

The loyal members of the SOCIETY who are assisting the Membership Committee in their continued efforts to obtain new members are listed below:

Name	Personal	Corporation	Name	Personal	Corporation
E. E. Ayars	1		Donald W. Ross	1	
B. M. Burchfiel	1		Edward W. Schramm	1	
H. T. Coss	2		J. H. Seasholtz		1
K. H. Endell	3		F. H. Sebring, Jr.	1	
R. F. Ferguson	1		J. B. Shaw	1	
J. W. Hepplewhite	2		Thomas A. Shegog	1	
Joseph W. Hoehl	1		E. Ward Tillotson	1	
Charles J. Hudson	1		Karl Turk	1	
H. J. Knollman	1		A. S. Zopfi		2
Jacob Lindley	1		Office	5	2
Frank S. Roberts	1				
				27	5
			Deductions (2 mo.)	7	0
			Net	20	5
				Total	32

Total Net increase for July 16 to August 15 25

1923 NET MEMBERSHIP RECORDS

		Personal	Corporation
January	12	1611	216
March	14	1710	223
April	14	1738	226
May	14	1775	233
June	14	1792	238
July	14	1808	244
August	14	1833	249
Net Gain (1923)		222	33
Same Period (1922)		220	49

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Albert S. Adcock, of Columbus is now living in Worcester, Mass.

Benjamin Alderson, of The American Bottle Co., Newark, Ohio, has recently been transfered to the offices of that company at Streater, Ill.

D. H. Applegate, Jr., asks that his address be changed to the Castleton Apts., St. George, Staten Island, N. Y.

P. S. Bachman, who has been in Wooster, Ohio, has moved to 222 E. Mulberry Street, Kokomo, Ind.

Robert A. Bautz, has moved from Murphysboro, Ill., to 120 W. Kinzie St., Chicago, Ill.

Marion W. Blair, is living at 614 N. 51st St. East St. Louis, Ill., Mr. Blair is in charge of the construction of a new plant for the H & R Mining and Mfg. Co.

A. B. Christopher, who has been with the Southern Brick Co., Jonesboro, Ark., is now with the Elk River Clay Products Corporation, Northeast, Maryland.

H. T. Coss, has recently taken a position with The Celite Company, Lompoc, Cal. Mr. Coss taught in the Ceramics Dept., Rutgers College, New Brunswick, N. J., last year.

Raymond T. Fesler, a graduate of the Ceramic Dept., at Ohio State University, this year is living at 222 E. Mulberry St., Kokomo, Ind.

John Fitzpatrick, of Cincinnati, Ohio, has moved to 39 Roebling Place, Niagara Falls.

E. B. Guenther, of the Harbison-Walker Refractories Co., has been transferred from the Pittsburgh office to Room 1987–208 So. La Salle St., Chicago, Ill.

P. A. Handke, has moved from 260 So. Academy St. to 351 W. North St., Galesbury, Ill., Mr. Handke is with the Purington Paving Brick Co.

L. C. Hewitt, of the Laclede Christy Clay Products Co., has moved to 4919 Lansdowne Ave., St. Louis, Mo.

G. S. Kennelley has moved to 3205 Philadelphia, W., Detroit, Mich. Mr. Kennelley formerly was connected with the American Refractories Co., of Joliet, Ill.

Spicer S. Kenyon, has moved from 321 First St. to 2214—15th St., Niagara Falls, N. Y.

J. M. Mallory, of the Central Georgia Railway Co., Savannah, Ga., gives 233 W. Broad St. as his Post Office address.

Midland Terra Cotta Co., of Chicago, Ill., has moved from the Lumber Exchange Bldg. to 105 West Monroe St.

Henry W. B. Perry, is living at 5900 Manchester, St. Louis, Mo.

Will A. Rhodes, formerly of the Chelsea China Co., New Cumberland, W. Va., is with Albert Pick & Co., 208–224 W. Randolph Street, Chicago.

W. A. Richeux, is associated with the Isolantite Co. of Amer. Inc., Bellville, N. J.

William Turner, Trenton Potteries Co., has moved to 1511 Brunswick Ave., Trenton, N. J.

Lawrence A. Vincent, has moved from Cleveland, Ohio, to 931 Homewood Ave., Zanesville, Ohio.

ADDRESSES UNKNOWN

Members of the American Ceramic Society are urgently requested to forward the correct addresses of the following persons whose Journals have been returned to the office of the Secretary as a result of an insufficient or incorrect address. The address given below with the name is the last one which appeared on the official files of the Society.

Arbentz, Fred J. A., Florentine Pottery Co., Cambridge, Ohio.
Austin, G. L., American Refractories Co., Joliet, Ill.
Baker, G. V., Penn Feldspar Co., Barnard, N. Y.
Bickel, Earl A., Postville Clay Products Co., Postville, Iowa.
Butterfield, Fred H., 4906 McPherson Ave., St. Louis, Mo. Crunden Martin Mfg. Co.
Byrnes, A. Marietta, 63 Anderson Pl., New Orleans, La.
Callaghan, J. P., % Teaque Hotel, Montgomery, Ala.
Cameron, C. V., Whiting-Mead Commercial Co., 2035 E. Vernon Ave., Los Angeles, Cal.
Darlington, Homer T., Box 736, Natrona, Pa.
Dolley, Dr. Charles S., Keramoid Mfg. Co., Fort Madison, Iowa.
Fujioka, Koji, Shofu Porcelain Mfg. Co., Kyoto, Japan.
Greenwood, John L., Lehigh Sewer Pipe & Tile Co., Lehigh, Iowa.
Henshaw, S. B., Libbey-Owens Sheet Glass Co., Charleston, W. Va.
Ichijo, Mokiji, % Japanese Ambassador, Hildbrandstr. 25, Berlin, Germany.
Ivery, Sidney H., 4432 Gibson Ave., St. Louis, Mo., Hydraulic Press Brick Co.
Johnson, J. William, 4148 Langland St., Cincinnati, Ohio, Clay Salesman, with National Sales Co.
Kitamura, Y., Shofu Kogo Kafushiki Kaisha (Shofu Industrial Co., Ltd.), Kyoto, Japan.
Knote, J. M., Mines Dept. L. S. Corporation, Sault Ste. Marie, Ont., Canada.
Leahy, T. Arthur, 5490 Ellis Ave., Chicago. Ill., A. P. Green Fire Brick Co.
Marr, H. William, % Canadian Libbey-Owens Sheet Glass Co., Hamilton, Ont., Canada.
Mitchell, W. Leon, Rock Island, Ill., Rock Island Stove Co.
Moller, Chr. Y. Knud, 4956 McPherson Ave. St. Louis, Mo., Laclede-Christy Clay Products Co.
Nies, F. H., Hamilton Ave. and Summit St., Brooklyn, N. Y.
Okura, K., 84 Kobayashi-Cho, Nagoya, Japan, Japan Porcelain Corporation.
Pendrup, W., Coonley Mfg. Co., Cicero, Ill.
Peck, J. Clair, 4961 Neosho St., St. Louis, Mo., Laclede-Christy Clay Products Co.
Pohs, J. F., 1097 Interstate Ave., Portland, Oregon, Portland Stove Works.
Proodian, E. K., Newtown, Pennsylvania, Bucks Company.
Pulsifer, H. M., Manhattan Building, Chicago, Ill., Geo. H. Holb & Co.
Ragland, A. Nugent, 1280 West Adams St., Los Angeles, California, Alberhill Coal & Clay Co.
Reid, W. H., 10 Stanley Pl., Yonkers, N. Y., Consolidated Gas Co. of New York.
Rennieburgh, Cedric L., A. C. Spark Plug Co., Flint, Mich.
Thompson, E. J., 2507 Townsend Ave., Detroit, Michigan, Detroit Stove Works.
Villalta, John F. R., Apartado No. 65, Barcelona, Spain.
Vodick, William J., 1733 Lake Ave., Wilmette, Ill., Chicago Hardware Foundry Co.
Weidman, Frank E., 38 S. Dearborn St., Chicago, Inland Steel Co.
Winkleman, E. J., Pittsburgh, Pa., American Refractories Co.

THE 1923 SUMMER MEETING
TOLEDO—DETROIT—FLINT
AUGUST 8-11

In the memories and in the lasting impressions of one hundred and forty seven attending members, the 1923 Summer Meeting of the AMERICAN CERAMIC SOCIETY is now a valued and pleasant record.

In the special cars in which the party traveled the sixty miles from Flint to Detroit, eighty-eight were on their feet uncovered and at attention for five minutes on Friday at 4 P. M. in grateful memory and honor of Warren G. Harding. The cars were still, silence prevailed, thoughts and pulse beats alone continued on. The reflections of each during that brief while were of the unselfish and full-time service with which our departed president had won the personal allegiance and sympathies of men and women the world over. He was our faithful servant, faithful in all details of the trust of his official position. He shirked not, but labored with unusual diligence and prayerfulness. His is now a record of labor well done and richly compensated. He profited most because he served well.

Allegiance to and prayers for the success of our new leader, Calvin Coolidge is and will continue to be in the hearts of us all. We are going on with the same fortitude and hopes as before.

Sixty-nine persons were guests of the Toledo hosts on Wednesday, August 8th. Of these sixty-nine, nine were visiting ladies. Messrs. A. S. Zopfi and W. H. Hess extended the greetings for the Toledo manufacturers. They provided the automobiles, directed the routing of the different groups to the factories and were the hosts at a most enjoyable luncheon at the Toledo Yacht Club. The Edward Fords Plate Glass Co., the Owens Bottle Glass Co., and the Buckeye Clay Pot Co., threw wide open their factory doors to the party. Guides explained in detail the processes and process control. They invited questions and freely gave information.

Thirty-six of the party took the afternoon boat to Detroit. The day was ideal. The Maumee River teemed with commercial and pleasure boating. Lake Erie was calm. The most interesting was the Detroit River. This is a winding river broken by islands, and the banks of which are lined with richly developed estates and immense factories. Large heavily laden vessels of commerce and speeding pleasure yachts coursed the river's surface, and airplanes were in the air above. It was a superb and restful trip. Friendships were made and notes compared. A more profitable and pleasant "section Q" was never held.

The Detroit committee met the delegates at the wharf and at the trains with buses. On arrival at the Hotel Wolverine each delegate found that he was already registered and his room key in the hands of the local committee. It was in this attentive detail that the local committee cared for every want of the delegates throughout the entire trip. Morning room calls with information of the days schedule made for readiness to start each trip on the dot of the appointed hour. Thanks to Frank H. Riddle, chairman of the general committee and in charge of the Detroit excursions and to Taine G. McDougal and his assistants in Flint, every appointment was kept on scheduled time and yet with maximum comfort and attention to the desires of the delegates.

The program as announced was carried through in detail. It is only of four occasions that special mention will be given. Record has already been made of the delightful luncheon at the Toledo Yacht Club given by the Toledo hosts. Ninety-eight persons enjoyed a chicken dinner on Thursday noon given in the plant of the Champion Porcelain Co. Friday noon, seventy partook of a beefsteak luncheon given by the A. C. Spark Plug Co., in Flint. These three luncheons were enjoyed at the time but the courtesy and good will of the hosts will always remain in the memories of the guests.

Ninety-two persons sat down to a most excellent banquet Friday evening. The most memorable and profitable part of this Friday evening occasion was the illustrated talks by Mr. C. E. Ball of the Square D-Co. on "Modern Pottery Methods" and by Dr. J. A. Jeffery on "Tunnel Kiln Control Methods." The Square D-Co., manufactures insulators. They purchased an old factory and modernized its arrangement and equipment. The Champion Porcelain Co., under the technical direction of Dr. Jeffery has

adapted and adopted every known control devise whereby exact conditions of manufacturing and burning are at all times maintained. These two lectures were listened to with rapt attention and profit.

While it was no startling revelation, yet it was the frequent topic of conversation that each of these rival concerns, the Champion Porcelain Co., and the A. C. Spark Plug Co., should invite and cordially welcome the technical and operating men of their respective firms. The most cordial attention and freedom from restraint was extended by each of these concerns to the visiting men from its business rival.

This same cordiality and freely giving of manufacturing information even to exchanging of recipes was the rule without an exception in all of the enameling plants visited. The Detroit-Star Grinding Wheel Co., told of what and how grinding wheels were made. The Ford Co., not only gave the batch that was being used that day but gave detailed information on methods and cost of continuous pour plate-glass making. Ours was the first visiting party allowed in the new plate glass plant of the Ford Co., and here the visiting delegates from other plate glass companies were given especial attention some of them remaining longer to make a more thorough study of the novel and very successful method here employed. This freedom and welcome to delegates from rival concerns was particularly notable at all the plants visited.

All in all, the 1923 Summer Meeting was a huge success; efficiently conducted and productive of valuable information and valued friendships.

Notes

The Ford Plate Glass Batch

Sand	400.0
Soda ash	130.0
Limestone	118.0
Salt cake	24.0
Cullet	150.0
Arsenic	1.8
Charcoal	1.3

Attending Delegates

Mr. and Mrs. August Staudt, Miss Augusta Staudt, Perth Amboy, N. J.
Thomas A. Shegog, Sebring, Ohio.
George A. Balz, Perth Amboy, N. J.
George Simcoe, Trenton, N. J.
James A. Aupperle, Middletown, Ohio.
Mr. and Mrs. A. W. Kimes, Pittsburgh, Pa.
Mr. and Mrs. Frank G. Roberts, Baltimore, Md.
Ralph E. Seasholtz, Reading, Pa.
Mr. and Mrs. D. W. McNeil, Cincinnati, Ohio.
Carl G. Hilgenberg, Baltimore, Md.
Fred E. Jewett, Muncie, Ind.
L. E. Riddle, Jr., Metuchen, N. J.
Emery W. Jones, Perth Amboy, N. J.
Robert F. Ferguson, Pittsburgh, Pa.
Ralph F. Brenner, Rochester, Pa.
Charles J. Hudson, Worcester, Mass.
I. B. Laud, Worcester, Mass.
C. S. Linder, Creighton, Pa.
A. E. Korman, Kohler, Wis.
J. M. Lambie, Washington, Pa.
J. W. Wright, Charleroi, Pa.
R. Ellsworth Arnold, Pittsburgh, Pa.
J. C. Hostetter, Corning, N. Y.
R. T. Stull, Savannah, Ga.
E. T. Montgomery, Franklin, Ohio.
J. B. Lyon, St. Louis, Mo.
M. G. Babcock, Pittsburgh, Pa.
W. F. Godejohn, St. Louis, Mo.
F. A. Tobett, Middletown, Ohio.
D. M. Strickland, Middletown, Ohio.

Robt. A. Bautz, Murphysboro, Ill.
George Blumenthal, Jr., Chicago, Ill.
Mr. and Mrs. W. L. Brownlee, Toledo, Ohio.
L. L. Hunt, New York City.
Amory Houghton, Corning, N. Y.
Elza F. Heistand, Muncie, Ind.
Fred Carder, Corning, N. Y.
Mr. and Mrs. D. A. Cable, Canton, Ohio.
Mr. and Mrs. L. W. Mercer, Peru, Ind.
A. S. Zopfi, Toledo, Ohio.
David B. Gibson, Chicago, Ill.
A. G. Wikoff, New York.
E. E. Ayars, Joliet, Ill.
Robert, F. Sherwood, Syracuse, N. Y.
D. E. Foley, Chicago, Ill.
G. W. Batchell, Toledo, Ohio.
F. L. Steinhoff, Chicago, Ill.
J. W. Cruikshank, Pittsburgh, Pa.
Chas. O. Grafton, Muncie, Ind.
O. H. Day, Cleveland, Ohio.
F. A. Bailey, Toledo, Ohio.
L. E. Ells, St. Louis, Mo.
Gordon Klein, Springfield, Ill.
W. H. Hess, Toledo, Ohio.
Francis C. Preston, Cleveland, Ohio.
W. M. Clark, Cleveland, Ohio.
Fred B. Garrod, Toledo, Ohio.
Mr. and Mrs. M. A. Gesner, Ridgewood, N. J.
O. N. Earl, East Liverpool, Ohio.
F. H. Riddle, Detroit, Michigan.
James L. Jensen, Brooklyn, N. Y.
Thomas S. Mann, Portland, Oregon.
Leslie Brown, Trenton, N. J.
D. P. Forst, Trenton, N. J.
J. A. Williams, Trenton, N. J.
Jos. Schermerhorn, Trenton, N. J.
A. P. Ball, Detroit, Michigan.
H. H. Sortwell, Trenton, N. J.
A. T. Fenton, Trenton, N. J.
G. W. Lapp, Le Roy, N. Y.
F. H. Hastings, Hartford, Conn.
Ira E. Sproat, New York City.
J. H. Forsyth, Cleveland, Ohio.
T. W. Black, Oshawa, Ont. Canada.
R. M. King, Maryville, Tenn.
V. A. Stout, New York City.
J. S. Halvert, New York City.
Mr. and Mrs. J. W. Wenning, Pittsburgh, Pa.
H. W. Weber, Pittsburgh, Pa.
Theo. Lenchner, Pittsburgh, Pa.
H. T. Bellamy, Chicago, Ill.
Mr. and Mrs. Wm. K. Lucktenberg, Zanesville, Ohio.
Leroy F. Hobert, Sandusky, Ohio.
F. Gelstharp, Pittsburgh, Pa.
Wm. V. Knowles, Chicago, Ill.
A. Thompson, Niagara Falls, N. Y.
C. J. Kinsie, Niagara Falls, N. Y.
F. Merian, Pittsburgh, Pa.
C. S. Hahn, St. Louis, Mo.
Mr. and Mrs. Homer F. Staley, New York.
W. H. Ball, Muncie, Ind.
G. S. Kennelley, Detroit, Michigan.
F. W. Dinsmore, Trenton, N. J.
H. M. Kraner, Flint, Michigan.
T. G. McDougal, Flint, Michigan.
S. J. McDowell, Flint, Michigan.
P. D. Helser, Flint, Michigan.
H. F. Royal, Detroit, Michigan.
Robt. Twells, Jr., Detroit, Michigan.
R. W. Green, Detroit, Michigan.
B. A. Jeffery, Detroit, Michigan.
C. R. Moore, Detroit, Michigan.
T. R. Harrison, Detroit, Michigan.
P. G. Schad, Detroit, Michigan.
J. T. Littleton, Jr., Corning, N. Y.
F. B. Felton, Detroit, Michigan.
F. H. Williams, Buffalo, N. Y.
Geo. Dougherty, Reading, Pa.
H. S. Freeman, Detroit, Michigan.
R. C. Purdy, Columbus, Ohio.
Philip Dressler, Cleveland, Ohio.
L. E. Jeffery, Detroit, Michigan.
E. B. Flu, Detroit, Michigan.
E. B. Baker, Detroit, Michigan.
Frederick E. Bausch, St. Louis, Mo.
Harry Bill, Detroit, Michigan.
W. C. Stief, Mt. Clemens, Mich.
C. E. Doll, Jr., Mt. Clemens, Mich.
D. L. Rouleau, Mt. Clemens, Michigan.
C. E. Bales, Louisville, Ky.
A. O. Bragg, Kalamazoo, Michigan.
J. A. Jeffery, Detroit, Michigan.
J. L. Graham, Detroit, Michigan.
R. D. Landrum, Cleveland, Ohio.
John R. Kempf, Detroit, Michigan.
Richard H. Turk, Baltimore, Md.
George F. Lang, Baltimore, Md.

FALL MEETING OF THE SOCIETY

Wednesday, September 19, is the date. Grand Central Palace, New York City, the place.

Exposition of the Chemical Industries, the occasion.

A program of technical papers will be given in the afternoon Wednesday the 19th. This program, however, will not be the whole reason why one could afford to spend time and money to attend this meeting. The Exposition furnishes opportunity to acquaint one's self with sources of raw and prepared materials; with the very latest methods of and equipment for manufacturing, and with precision control methods and instruments. It also gives opportunity to meet those who are producing materials and equipment.

We know of one Ceramic concern which has profited many times the expense of sending three or four of its employees to this exposition because of the new processes and equipment which their men saw at the Exposition and which the concern has adopted.

This is a splendid opportunity to learn of the best and to get acquainted with the most helpful.

September 19, Grand Central Palace.

NOTES AND NEWS

THE FOURTH CONFERENCE OF THE INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

The International Union of Pure and Applied Chemistry met in Cambridge, England, June 17 to 20, 1923, under the presidency of Sir William Pope. The meeting was attended by delegates from 20 countries.

The Committee on Ceramic Products made the following report which was adopted by the Union:

(1) The Union recommends that, for technical and scientific purposes, the term "ceramic" be employed in connection with all industries manufacturing the following products:

Here follows the list which appears in the report of the AMERICAN CERAMIC SOCIETY's Committee on Definition of the Term "Ceramic."[1]

(2) The Committee recommends that there be established in each country an exact nomenclature of terms used for ceramic raw materials and manufactured products, together with exact definitions of such terms.

(3) The Committee unanimously agreed to place upon the agenda of the next meeting of the Union the question of the selection of typical or standard raw materials which could be employed for the purpose of studying the chemical and physical properties of refractory earths as well as proposed methods of testing.

(4) The Committee approved certain recommendations of M. Henry Le Chatelier and of M. Capsa concerning a proposed coöperative investigation to be carried out by the various ceramic laboratories of the world, but it suggested that the proposed study be executed on selected samples of the same set of raw materials in order that the results obtained should be strictly comparable. The Committee also expressed the opinion that the various laboratories should, if possible, reach some agreement as to apparatus for determining coefficient of expansion.

(5) The Committee expressed the hope that Prof. Henry Le Chatelier would accept the general direction of the proposed coöperative investigation in order to insure the proper coördination of effort.

[1] See *Jour. Amer. Ceram. Soc.*, **3** [7], 526 (1920).

THE NATIONAL LIME ASSOCIATION—ORGANIZED FOR EXTENSIVE RESEARCH WORK

The National Lime Association at its Annual Convention in June, has adopted a plan of organization which assures the continuation of its growing program of technical and research work and established a stability to the National organization which will make possible to establish and follow through to conclusion problems of research for the general benefit of the industry.

The National Officers and Board of Directors remain as the controlling body, directing the entire research and trade promotional program of the industry, but for the purpose of assuring a continued source of income for all departments of the Association and adding more flexibility to the local field promotional work, the program has been divided into two separate departments; first, the National program of technical research, publicity and National promotion; second, local trade promotional work by men in the field, sub-divided and directed from two Division offices with headquarters located at Washington and Chicago.

The members of the Association have agreed on basis of dues for a period of two years, which will afford the National program of technical research work a larger working budget than has been heretofore available, and the members in both the Eastern Division and the Central Division have agreed on a basis of additional dues which allows for a considerable increase in local field promotional work in the two Divisions.

The Lime Association loses the able leadership of Mr. Charles Warner, who has served as its President for the last four years, and who has been primarily responsible for bringing the work of the National Association to its present high standard.

The new President, Mr. George B. Wood, is President and General Manager of the Rockland and Rockport Lime Corporation, of Rockland, Main. He is a technically trained engineer, having received his degree from the Massachusetts Institute of Technology, has been an active Director of the National Association, and has added much to the lime industry in the way of technical advancement. He is a most enthusiastic believer in the future growth of the lime industry as the result of technical research and development, and is happily chosen as a successor to Mr. Warner.

Mr. William R. Phillips, the former General Manager of the Lime Association, has resigned to take the position of Vice President and General Manager of the American Lime & Stone Company. The Headquarters Office and organization is now working under the management of Mr. Burton A. Ford, Acting Secretary, who carries along the work well qualified by his experience during the last year as Mr. Phillips' assistant at the Washington office. Mr. Ford is a technically trained man, receiving his degree from the University of Maryland. Prior to joining the Association staff he was a Division Manager of the Virginia-Carolina Chemical Company and Secretary-Treasurer of the Bryant Fertilizer Company.

Dr. M. E. Holmes has resigned from the technical staff of the Association, and Dr. G. J. Fink has been appointed Chemical Director. Dr. Fink is a graduate of Wabash College and was for six years instructor in Chemistry at Cornell University, where he received his Ph.D. degree in 1914. He was also Professor of Chemistry at Iowa State College, and for five years prior to coming to the Lime Association was Research Chemist for the Hooker Electrochemical Company. Dr. Fink has been with the Association staff for two years, and is well qualified to assume the direction of the chemical and research problems.

In addition to work at the Association Laboratory in Washington, the Lime Association is supporting at the present time fellowships in five leading technical institutions where various special problems of investigation and research work are being carried through to conclusion. Coöperative relations also exist with other institutions where

important research on lime problems is being conducted. The increased budget for this class of work will make possible, under the two year program, the completion of the many problems on hand, and the inclusion of new important problems.

The personnel of the National Lime Association is as follows:

President	George B. Wood	Rockland, Maine
Vice-President	Fred Witmer	Woodville, Ohio
Treasurer	Milton McDermott	Knoxville, Tenn.
Board of Directors:		
	A. N. Griffing	Danbury, Conn.
	C. J. Curtin	New York, N. Y.
	George LeGore	LeGore, Md.
	O. J. Vanderpool	New York, N. Y.
	Warner Moore	Richmond, Va.
	J. J. Urschel	Toledo, Ohio
	F. M. Pinnegar	Cleveland, Ohio
	Morgan Curtis	Petoskey, Mich.
	B. L. McNulty	Chicago, Ill.
	Col. C. W. S. Cobb	St. Louis, Mo.
	R. C. Brown	Oshkosh, Wis.
	J. M. Gager	Chattanooga, Tenn.
	J. F. Pollock	Kans. City, Mo.
	H. Dittlinger	New Braunfels, Tex.

Headquarters Staff:

Burton A. Ford	Acting Secretary
R. C. Towles	Office Manager
Dr. G. J. Fink	Chemical Director
W. A. Freret	Consulting Engineer
J. A. Slipher	Soil Technologist
R. P. Brown	Construction Engineer

Eastern Division — Division Office — Washington, D. C.

Henry M. Camp	Division Manager
R. C. Parker	Agronomist
W. F. Campbell	Construction Engineer
W. F. Beyer	Construction Engineer
W. D. Steward	Construction Engineer

Central Division — Division Office — Chicago, Ill.

G. B. Arthur	Division Manager
L. B. Burt	Chemical Engineer
A. B. Giett	Construction Engineer
W. H. Magee	Construction Engineer
C. O. Dowdell	Construction Engineer
A. C. Hamilton, Jr.	Construction Engineer
L. E. Johnson	Construction Engineer
O. A. Wakeman	Construction Engineer

GOVERNMENT ADOPTS STANDARDS FOR WHITE CHINA[1]

Three standard sets of chinaware for government use were agreed upon at a joint meeting of the vitrified chinaware manufacturers' committee and the Committee on China and Glassware of the Federal Specifications Board held recently at the Bureau of Standards. The sets adopted are: one-half thick chinaware for enlisted men's dining service as used in the Army, Navy, and Marine Corps; vitrified hotel chinaware for all government dining room service and hospital service where desired; and one quarter thick vitrified chinaware for hospital service. Drawings of the different articles are now being made so that each purchasing department and manufacturer can be supplied with a set of blueprints.

Those present at the meeting were: F. Sutterton, Maddock Pottery Co.; W. L. Huber, Onondaga Pottery Co.; L. H. Bown, Buffalo Pottery Co.; A. L. Goulding, Warwick China Co.; C. W. Read, Shenango Pottery Co.; J. A. Egleston, Fleet Corporation; G. A. Bentley, Quartermaster Corps; R. D. Kinsey, U. S. Public Health Service; B. Puryear, U. S. Marine Corps; A. E. Williams, Bureau of Standards; R. F. Geller, Bureau of Standards; F. Hazelwood, Bureau of Standards.

CALENDAR OF CONVENTIONS

American Association of Iron and Steel Electrical Engineers—Buffalo, N. Y., September 24–28, 1923.

AMERICAN CERAMIC SOCIETY (Annual Meeting)—Atlantic City, Feb. 4, 5, 6, 7, and 8, 1924.

AMERICAN CERAMIC SOCIETY (Exposition Meeting)—New York, September 17–22. Wednesday, September 19, is Ceramic Day.

American Chemical Society (Fall Meeting)—Milwaukee, Wis., September 10 to 14, 1923.

American Electrochemical Society (44th Meeting)—Dayton, Ohio, September 27–29, 1923.

American Face Brick Association (Southern Group)—West Baden, Ind., November, 1923.

American Gas Association—Atlantic City, October 15–20, 1923.

American Institute of Electrical Engineers—Del Monte, Calif., October 2 to 5, 1923.

American Society of Sanitary Engineers—Davenport, Ia., September 10–13, 1923.

Common Brick Manufacturers of America—Los Angeles, week of Feb. 11, 1924.

National Exposition of Chemical Industries—New York City, September 17–22, 1923.

National Safety Council—Buffalo, N. Y., October 1–6, 1923.

New York Hotel Association—New York City, November 19–24, 1923.

Power and Mechanical Engineers—New York City, December 3–8, 1923.

[1] Received July 26, 1923.

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Vol. 2 — October, 1923 — No. 10

EDITORIAL

OPERATIVES INSTITUTE OF REFRACTORIES MANUFACTURERS

In the *Bulletin* section of this issue of the *Journal* is an account of an Institute organized for and by plant operators under the general sponsorship and guidance of the Refractories Manufacturers Association. Particular attention is drawn to this for in the first place it is an educational enterprise the like of which every trade association should sponsor. In the second place the American Ceramic Society would be remiss in its obligations if it did not give encouragement and assistance in the establishing and maintaining of every workable scheme of extending educational opportunities to plant operators.

Extension work by Universities among farmers and housewives has been developed during the past two decades with large benefits accruing. It is not for social purposes, but because of an earnest desire to learn of the most profitable ways and means on the farm and in the home that institute meetings are held in the rural districts in every State in the Union. This bringing to the land and home toilers the fundamentals as developed in the laboratories and taught in the Universities reacts beneficially on the educational and research institutions, for it focuses attention onto the most urgent problems.

Progress can be had only through production of things that are necessary to comfortable and profitable living with less human effort and financial expense. The farmer is forced to this as is the housewife. The operators in ceramic plants have the same need. They may not realize it. They may think the need of and benefits from all these educational enterprises are for the employers' profit alone, without realizing that progress in manufacturing is possible only through improvement in the manner of doing factory work and that the plant which progresses most furnishes the most profitable and pleasant opportunities for employment. The keystone to industrial progress, profit and pleasure rests with the operators and when the operators are being served and are serving according to the best information extant all coöperating parties are benefited.

The example set by the Refractories Manufacturers' Association is recommended to all ceramic trade associations for careful consideration, for the conducting operator institutes will bring returns far in excess of their cost.

To the Ceramic Departments of Universities these institutes are commended as exceptional opportunities for extending their influence beyond the lecture halls and laboratories. No more fruitful opportunity for coöperation in educational enterprise has been devised than is to be found in Operators Institutes sponsored by Trade Associations.

PAPERS AND DISCUSSIONS

NOTE ON "THE MEANING AND MICROSCOPIC MEASUREMENT OF AVERAGE PARTICLE SIZE"[1]

By E. P. Wightman[2]

Recently Perrott and Kinney have contributed an interesting article under the above title to the *Journal of the American Ceramic Society.* They state, very truly, that "the term 'average particle size' is capable of various mathematical interpretations many of which have little practical significance. The usual statistical method...considers only numbers of particles of a given size in determining the average diameter.... In practice it is difficult to dissociate a particle from its surface or volume." These authors take as the basis of measurement of particle size the "average diameter," and suggest that this be obtained, for ceramic materials, fillers, etc., from the formula

$$d_{av.} = \frac{y_s\, d}{100} = \frac{\Sigma\, nd^3}{\Sigma\, nd^2}$$

where y_s is the per cent of total surface represented by particles of diameter, d, and n is the relative number of particles of the same diameter. For coal or ore analysis they suggest the formula

$$d_{av.} = \frac{\Sigma\, y_v\, d}{100} = \frac{\Sigma\, nd^4}{\Sigma\, nd^3}$$

where y_v is the per cent of total volume of particles of diameter, d.

It seems to the writer that if one is to have a value which is of practical significance one should not choose always the average diameter, but average area, volume, or particularly in some case as a more accurately determinable value, the average *projective area* of the particles per unit of material.

In the above-mentioned materials this unit would be most likely the gram, but in photographic materials, for example, and perhaps even in the case of paints, it would be unit area of the plate surface, or surface to be covered. In the case of photographic materials where "average projective area" is used there is no uncertain third dimension, thickness, and the value is obtained practically from the relation

$$\bar{a} = \frac{\Sigma(y_a\, a)}{\Sigma\, y_a}$$

where y_a is the number of particles of each size (projective area), a, per unit (volume, area, mass, etc.) of the material, or of the surface on which

[1] *Jour. Amer. Ceram. Soc.,* 6 [2], 415 (1923).

[2] Received July 24, 1923.

it is coated. Rigidly of course this value should be obtained by integration, but where the class limits are not too large the error is negligible.

The writer, S. E. Sheppard and A. P. H. Trivelli,[1] have described a simple method of obtaining the size-frequency and size-area distribution of particles of a disperse material which they believe is less subject to error than that of either H. Green,[2] or of Perrot and Kinney.[3] Briefly, the disperse material is mounted on a microscopic slide by any suitable method, such that the ratio of amount of material per unit area of slide to the original unit is known. The grains are photomicrographed at a magnification commensurate with the sizes of the grains to be measured and the photomicrographs are further enlarged on a contrast paper, and the grains are then measured on the basis of a uniform projective-area scale by means of a rule calibrated in the limiting diameters corresponding to such uniform area classes, and the class sizes are read off directly. The average of the longest and shortest dimension, except where the grains are very irregular, gives a close approximation of the true mean class size. The very irregular grains can be measured either by a planimeter or by means of transparent cross-ruled paper. Wider or narrower class limits may be taken depending upon the accuracy desired. The writer in most of his work uses $0.2\mu^2$ as the class unit, but this is far too narrow for certain kinds of work.

In the case of ceramic materials a special rule could be made at a very small cost to read class-size directly in uniform volume increments, by having it calibrated in diameters corresponding to the class limits in volume assuming, of course, the volumes to be cubes or spheres. If the grains to be measured are thicker or thinner than this, a correction factor could be applied.

The same principle applies also to the case of any other material where volume or mass is more important than projective area.

Research Laboratory
Eastman Kodak Company
Rochester, N. Y.

DISCUSSION ON "NOTES ON THE DETERMINATION OF TRANSLUCENCY OF BODIES"[4]

Mr. Watts:—I should like to ask Mr. Parmelee whether they find it is possible to express the different values for different thicknesses in such a way that it can all be reduced to terms of unit thickness.

[1] *Jour. Phys. Chem.*, **27,** 1 (1923).
[2] *Jour. Franklin Inst.*, **192,** 638 (1921).
[3] *Loc. cit.*
[4] C. W. Parmelee and R. E. Lowrance, *Jour. Amer. Ceram. Soc.*, **6** [5], 630 (1923).

MR. PARMELEE:—That is our experience which is in accordance with Steger's recent report and also with Ashley's report.

MR. WATTS:—You are simply indicating the point on the test piece at which you make the test and then break it and measure it with a micrometer?

MR. PARMELEE:—We took the thicknesses at five different points, compared with a micrometer and calculated the average value for the thickness. We could have broken the pieces of course, but we did not do it.

MR. WATTS:—Were all these trial pieces jiggered?

MR. PARMELEE:—No. They were all cast.

MR. WATTS:—We already know that where the clay content differs you get a different density in the cast piece. Now, were you able to tie up in any way the apparent difference in density or have you any comparative data whereby we would be able to correct, if correction was necessary, for the difference in density? A correction was made for the specific gravity of the different slips, but I wondered if there was any evidence to show that difference in density of the cast body would really be a factor.

We have found so much of our data are apparently all right until somebody discovers that, "The difference in your ball clay content will give you different density and, therefore, your values are all off." I wondered whether these test pieces, as observed by you, are sufficiently uniform so that factor could be ignored. It seems to me we can ignore some of these points in making such determinations but if we are going to have a proposition which is absolutely precise and exact, it seems to me those things are of interest.

MR. PARMELEE:—The relative densities of the clays used and their influences upon the finished product were not considered in this experiment.

MR. WATTS:—They were all prepared under the same conditions?

MR. PARMELEE:—Yes.

MR. SPURRIER:—Are these glazed?

MR. PARMELEE:—No.

MR. SPURRIER:—Does the character of the surface influence the amount of light passing through? Suppose you have a very smooth polish. A good many years ago it was thought that surface radiations were disembodied. Pieces were covered with a certain varnish and results were very, very close in all cases, although there were no differences in surface, but it turned out that they really were determined by the covering of varnish.

MR. PARMELEE:—There is no doubt about the effect. The amount of the light transmitted depends on the character of the surface. We undertook to prepare the pieces as uniformly as possible.

ACTIVITIES OF THE SOCIETY

THE PRESIDENT'S PAGE

I wonder if the members realize to what extent the accomplishments, in fact the entire success of the SOCIETY depends on the activities of its Committees. This year, much like other years, the first six months have gone by with very little committee activity beyond sustaining interest in the projects already under way and as a result very little of new has been accomplished.

A few committees notably the Membership and Summer Meeting Committees and the Committee on Program and Papers have been busy and deserve the thanks of the officers and members.

Letters have been addressed to the Chairmen and members of the various committees outlining activities which during the next few months and years will lead to large accomplishments. After all it is accomplishment that is wanted; the activities are only means to accomplishments. The Chairmen must carry the responsibilities and it is to them that I appeal to use the next few months in such a way that the year will rank well above the average in things accomplished.

With the summer over the various Sections will again become active. The experiment tried by several Sections in the past year of holding joint meetings with other technical societies has been very successful and will be continued and extended.

The Membership Campaign is progressing steadily, but we need more workers. The SOCIETY has eighteen hundred personal members. If each one of those will ask, *merely ask,* one man to join within the next thirty days we shall have many new members. Try it, you who are interested enough in the SOCIETY to read the President's page.

It is not, primarily, that the SOCIETY shall have greater financial resources that new members are sought. It is that with more serving and being served the SOCIETY will have larger opportunities and its accomplishments made more effective.

NEW MEMBERS RECEIVED FROM AUG. 16 TO SEPT. 15

PERSONAL

Duncan M. Dayton, 190 Riverside Drive, New York, N. Y. (Vice President, N. Y. Vitreous Enamel Products Corp.)

J. C. DeKort, 26 Vermont St., Wheeling, W. Va. (Ceramic Printer, Warwick China Co.)

Charles E. Foose, c/o Wheeling Tile Co., Wheeling, W. Va.

Harry S. Haze, 404 S. Wells St., Chicago, Ill. (Merchandise Broker.)

Kenneth D. Joseph, 6370 Burchfield Ave., Squirrel Hill, Pittsburgh, Pa. (Sup't. of Sales, The O. Hommel Co.)

Erwin F. Lowry, Armstrong Cork Co., Lancaster, Pa. (Research Physicist.)

Joseph Lynch, 142 N. High St., Mount Vernon, N. Y. (Foreman Enamel Dep't. Ward Leonard Electric Company.)

Max Meth, Blackstone Bldg., Room 512, Pittsburgh, Pa. (Chemist.)

G. Verner Nightingale, 316 Bulletin Bldg., Philadelphia, Pa. (Sales Engineer, The Celite Products Co.)

John W. Patterson, Western Sheet Glass Co., Torrance, Calif. (Chief Engineer.)

L. E. Riddle, Jr., 67 Spring St., Metuchen, N. J. (Sales Manager, The Edgar Plastic Kaolin Co., and Edgar Bros. Co.)

John V. Rock, 366 W. Main St., Newark, Ohio.

Y. Sakamoto, c/o Research Laboratory, Asahi Glass Co., Kikuicho, Ushgome, Tokyo, Japan. (Chemist.)

Cyril C. A. Schwerha, P. O. Box 77, 5th & Monongahela Ave., Glassport, Pa. (Draftsman, Macbeth-Evans Glass Co.)

Arthur R. Stanbra, 26 Vermont St., Wheeling, W. Va. (Designer, Warwick China Co.)

John M. Tuthill, Philadelphia Porcelain Co., Woodlynne, Camden, N. J. (Vice-President and Secretary.)

John T. Wells, National Art Pottery Co., Coshocton, Ohio. (Secretary.)

Corporation

The DeVilbiss Mfg. Co., Toledo, Ohio. Frank A. Bailey. (Superintendent).

Penn Tile Works Co., Inc., Aspers, Pa. D. C. Asper. (President.)

Roberts and Mander Stove Co., Hatboro, Pa. Kenneth C. Farnsworth. (Gen'l Sup't.)

Active assistants to the Membership Committee are named in the following columns.

Name	Personal
J. C. De Kort	1
T. Raymond Edgar	1
Charles A. Facer	1
Mabel C. Farren	1
Frederick G. Jackson	1
Harry F. Kahn	1
R. D. Landrum	1
Carl F. Miller	1
M. Namba	1

Name	Personal	Corporation
Frederick H. Rhead	1	
Joseph P. Rodgers		1
Charles L. Stamm	1	
Roy E. Swain	1	
R. A. Weaver	1	
W. W. Wilkins	1	
A. S. Zopfi		1
Office	3	1
	17	3
Less	3	0
Net gain	14	3

1923 Net Membership Records

		Personal	Corporation	
January	12	1611	216	
March	14	1710	223	
April	14	1738	226	
May	14	1775	233	
June	14	1792	238	Total Roster
July	14	1808	244	Sept. 15
August	14	1833	249	2099
September	14	1847	252	
Net Gain (1923)		236	36	
Same Period (1922)		251	60	

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Erling E. Ayars, Chairman of the Refractories Division of this SOCIETY, is now living at 317 N. Eastern Ave., Joliet, Ill.

C. J. Crawford gives 2615 Singer Building, New York City as his business address. Mr. Crawford's home is still in St. Louis.

Charles A. Facer, formerly of Steubenville, Ohio, is now living at Wheeling, W. Va.

J. William Gayner, formerly of the Gayner Glass Works of Salem, N. J., is connected with the Lynchburg Glass Corporation at Lynchburg, Va.

Herbert Goodwin, recently of the Crescent China Company, Alliance, Ohio, has moved to Niles, Ohio, where he is working for the Atlas China Company.

John S. Halbert, Sales Engineer for the Hardinge Company, has moved to 7409 N. Ashland Blvd., Chicago, Ill.

Ives L. Harvey is President of the New Hope Brick Company at New Hope, Pa.

Mokiji Ichiji, who was reported in the list of "unknowns" in the September *Bulletin*, writes from Berlin that his future address will be c/o Nishikawa, 96 Eirakcho 1 chome, Keijo, Chosen, Japan.

Shigeba Kanashima, another Japanese member writes that his new address is Kamisakebe, Mitsugun, Okayama-ken, Japan.

Homer Knowles, who organized the Homer Knowles Pottery Company, is living at 747 Coe Ave., San Jose, Cal.

J. A. Martz has moved to New Brunswick, N. J., where he is teaching in the Department of Ceramics at Rutgers College.

D. M. McCann has left the Sterling Grinding Wheel Company of Tiffin, Ohio and is connected with the Michigan Porcelain Tile Works of Ionia, Mich.

Edward Milliken has moved from Columbus, Ohio to 1009 N. Water St., Uhrichsville, Ohio.

O. S. Mundy, formerly of Urbana, Ill., is now living at 316 Jackson St., Huntingburg, Ind.

S. O. Neiswanger gives Harvey, Iowa as his new address.

Elmer H. Ockerman of the Los Angeles Pressed Brick Company is living at 3731 S. Main St., Los Angeles, Calif.

R. S. Olsen of Champaign, Ill. has moved to Fox Lake, Ill.

T. Wilfred Owen has accepted a position as Ceramic Engineer with the Queen's Run Refractories Co., Inc., Lock Haven, Pa.

Amos Potts, Secretary of the Heavy Clay Products Division of the SOCIETY has moved from Columbus, Ohio to 118 E. Blaine St., Brazil, Ind.

W. H. Powell gives 350 Madison Ave., New York City as his new address.

A. Nugent Ragland, who was reported in the list of addresses unknown in the September *Bulletin*, is located with the Perth Amboy Tile Company, Perth Amboy, N. J.

Gregory L. Rogers is living at 7176 Hawthorn Ave., Hollywood, Calif.

Robert F. Sherwood has moved from Syracuse, N. Y. to Solvay, N. Y. where he is Ceramic Engineer with Pass and Seymour, Inc.

Charles A. Smith, B.S., graduate in ceramics of Ohio State University, June, 1923, has entered Lehigh University at Bethlehem, Pa., where he will continue his studies, doing post graduate work in metallurgy.

Paul Teetor has moved from McKinley Ave., to 911 Edgewood Ave., Trenton, N. J.

Thomas C. Walker, Jr., formerly of Columbus, Ohio, is now with the Los Angeles Pressed Brick Company, Los Angeles, Calif.

S. D. Yang is taking special work in cement making at the University of Michigan, Ann Arbor, Mich.

D. C. Wysor whose local address is Owensville, Mo., gives 40 Rector St., c/o General Chemical Company, New York City as his permanent address.

M. K. Zimmerman writes that he has moved from East Liverpool, Ohio to 1609 Ridge Ave., Steubenville, Ohio.

SYMPATHY AND GREETINGS TO JAPAN

The following note of sympathy from President Greaves-Walker has been mailed to each Japanese member of the AMERICAN CERAMIC SOCIETY.

> "Mere words and figures will not bring to America a full realization of the awful calamity that has befallen the Japanese people. This is on account of the great distance we are away.
>
> We wish you to know of the sympathy which is felt by all of us. We shall await with no little concern a report fully of your safety."

REPORT OF THE FALL MEETING

Another successful occasion is now a matter of record, that of the Fall Meeting of the AMERICAN CERAMIC SOCIETY. Many said that the following program was one of the most informing and inspiring they had ever heard. While the a la carte dinner was marred by the fact that adequate provision was made for only sixty of the eighty-six who attended yet this was a satisfactory meeting together of the members and their friends. The record of the Fall Meeting in New York City, September 19, 1923, in connection with the National Exposition of Chemical Industries is one of which the SOCIETY is justly proud.

The Program

A. PROMOTING FUEL ECONOMY IN KILN MANAGEMENT

(1) Report of Results in Coöperative Investigations by Refractories Manufacturers' Association and U. S. Bureau of Mines.
By Frederick W. Donahoe, Secretary, Ref. Mfg. Assn.

(2) Possible Economies in Kiln Firings.
By George A. Bole, U. S. Bureau of Mines.

B. INDUSTRIAL ART

(1) The Industrial Art Movement, Its Possibilities in Ceramic Industries.
By Richard F. Bach, Curator Industrial Arts, Metropolitan Museum.

(2) Method of Color Measurement, An Industrial Need.
By A. E. O. Munsell, Munsell Color Co.

(3) A Scientific Color Analysis.
By H. S. Busby.

C. FEDERAL COÖPERATIVE MOVEMENTS

(1) Investigations by and Purposes of the Federal Specifications Board in Reference to Ceramic Products.
By R. F. Geller, U. S. Bureau of Standards.

(2) The American Construction Council, Its Aims and Methods.
By D. Knickerbocker Boyd, Vice-President.

D. Refractories
(1) The Properties of Some Commercial Refractories.
By R. M. Howe, Kier Fire Brick Co.
(2) The Manufacture of Refractories.
By W. F. Rochow, Harbison-Walker Refractories Co.

The Attendance

Allan, Reginald, Newark, N. J.
Allen, F. B., Woodbridge, N. J.
Applegate, D. H., New York, N. Y.
Armstrong, C. H., East Liverpool, Ohio
Baldwin, H. C.
Barth, Victor, Great Barrington, Mass.
Barlow, R. S., New York, N. Y.
Bernier, A., Montreal, Que.
Bernhard, E. J., New York, N. Y.
Bloomfield, Chas. A., Metuchen, N. J.
Bloomfield, Howard W., Metuchen, N. J.
Bole, Geo. A., Columbus, Ohio.
Booze, M. C., Pittsburgh, Pa.
Brenner, R. F., Parkersburg, W. Va.
Brown, Leslie, Trenton, N. J.
Brown, H. E., Palmerton, N. J.
Brown, G. H., New Brunswick, N. J.
Bruswaiger, H. P., New York, N. Y.
Burroughs, F. H., Trenton, N. J.
Busby, H. S., New York, N. Y.
Butler, W. W., Cleveland, Ohio.
Byers, L. L., Philadelphia, Pa.
Campbell, A. R., Metuchen, N. J.
Carter, J. D., Philadelphia, Pa.
Carrier, A. D., Mechanicsville, N. Y.
Caven, F. M., New York, N. Y.
Chaffin, E. G., Worcester, Mass.
Clare, R. L., Perth Amboy, N. J.
Clark, W. M., Cleveland, Ohio.
Clarke, J. H., Wilmington, Mass.
Crane, C. W., Elizabeth, N. J.
Crawford, C. J., St. Louis, Mo.
Crofoot, A. B., Plainfield, N. J.
Cushman, H. D., Cleveland, Ohio.
Daley, J. F., Astoria, N. Y.
Dierauf, E., Hackensack, N. J.
Dinsmore, F. W., Trenton, N. J.
Dorsey, F. M., Cleveland, Ohio.
Dougherty, L. A., Long Island City, N. Y.
Easter, G. J., Niagara Falls, N. Y.
Edgar, D. R., Metuchen, N. J.
Edgar, I. R., Metuchen, N. J.
Egan, F. W., New York, N. Y.
Eldridge, C. H., Metuchen, N. J.
Finn, A. N., Washington, D. C.
Forse, E. B., Perth Amboy, N. J.
Franzheim, C. M., Wheeling, W. Va.
Geiger, Chas. F., Perth Amboy, N. J.
Geller, R. F., Washington, D. C.
Gesner, M. A., New York, N. Y.
Geyer, L. E., Columbus, Ohio.
Gibson, D. B., Chicago, Ill.
Gibson, Thos. W., Toronto, Ont.
Goetschins, H. B., Roscoe, N. Y.
Goheen, J. P., Philadelphia, Pa.
Greenwood, W. W., Worcester, Mass.
Gregory, M. C., Corning, N. Y.
Hagar, Donald, Matawan, N. J.
Hagar, I. D., New York, N. Y.
Handy, Jas. O., Pittsburgh, Pa.
Hanna, R. E., Perth Amboy, N. J.
Harrison, H. C., Columbus, Ohio.
Hassinger, C. C., Plymouth Meeting, Pa.
Hastings, F. H., Hartford, Conn.
Henry, A. V., Columbus, Ohio.
Hill, E. C., Philadelphia, Pa.
Hill, C. W., Perth Amboy, N. J.
Horning, Roy A., Lancaster, Pa.
Hostetter, J. C., Corning, N. Y.
Hottinger, A. F., Chicago, Ill.
Howat, W. T., Perth Amboy, N. J.
Howe, R. M., Pittsburgh, Pa.
Hunting, E. C., Alfred, N. Y.
Husch, W. C., Chicago, Ill.
Ingram, Charles, New York, N. Y.
Jones, Chester H., Chicago, Ill.
Keller, G. W., Philadelphia, Pa.
Kester, W. B., Spruce Pine, N. C.
Kingsbury, P. C., Keasby, N. J.
Klein, A. A., Worcester, Mass.
Krak, J. B., New York, N. Y.
Ladoo, R. B., Cleveland, Tenn.
Landrum, R. D., Cleveland, Ohio.
Larson, E., New York, N. Y.
Logan, L., Pittsburgh, Pa.
Low, Thos. M., Cleveland, Ohio.
McCaughey, W. J., Columbus, Ohio.
McFarland, L. W., New York, N. Y.

McKeown, T. H., New York, N. Y.
McNeill, W. K., Toronto, Ont.
Mahnken, H. J., Elizabeth, N. J.
Mallory, J. M., Savannah, Ga.
Malsch, W., New York, N. Y.
Martz, J. A., New Brunswick, N. J.
Mathiasen, Alfred, Matawan, N. J.
Mathiasen, O. E., Perth Amboy, N. J.
Minton, R. H., Metuchen, N. J.
Moore, Jos. K., New York, N. Y.
Muessig, C. N., New York, N. Y.
Munn, James, Cleveland, Ohio.
Munsell, A. E., Baltimore, Md.
Navias, Louis, Washington, D. C.
Newcomb, R. N.
Nightingale, G. V., Philadelphia, Pa.
O'Brien, T. H., Providence, R. I.
Ogden, E. P., Philadelphia, Pa.
Patch, Clifford, Bangor, Maine.
Penfield, L. W., Willoughby, Ohio.
Pettit, Ralph E., Chicago, Ill.
Pigott, H. W., Philadelphia, Pa.
Pratt, J. H., Chapel Hill, N. C.
Purdy, Ross, C., Gen. Secy. Amer. Ceram. Soc.
Putnam, L. E., New York, N. Y.
Ragland, N. A., Perth Amboy, N. J.
Rhead, F. H., Zanesville, Ohio.
Rhead, Lois W., Zanesville, Ohio.
Richardson, P. B., Boston, Mass.
Riddle, L. E., Jr., Metuchen, N. J.
Robinson, C. J., Canandaigua, N. Y.
Rochow, W. F., Pittsburgh, Pa.
Rose, R. P., New York, N. Y.
Runge, F. W., Rochester, N. Y.
Saxe, Chas. W., Worcester, Mass.
Schmolze, P. E., New York, N. Y.
Scott, W. J., Washington, D. C.
Seasholtz, J. M., Reading, Pa.
Shaw, J. B., Alfred, N. Y.
Shaw, L. I., Washington, D. C.
Shearer, W. L., Washington, D. C.
Shegog, T. A., Sebring, Ohio.
Sheppard, Mark, Norristown, Pa.
Simcoe, Geo., Metuchen, N. J.
Slack, Robt. M., New York, N. Y.
Smith, C. A., Bethlehem, Pa.
Smith, P. A., New Brighton, Pa.
Smith, R. G., Chicago, Ill.
Smith, Norman G., Brunswick, Me.
Solomon, M., New Haven, Conn.
Sortwell, H. H., Trenton, N. J.
Sperr, F. W., Jr., Pittsburgh, Pa.
Sproat, Ira A., New York, N. Y.
Staley, H. F., New York, N. Y.
Stamm, C. L., Mount Vernon, N. Y.
Staudt, August, Perth Amboy, N. J.
Stanger, Frederick, Philadelphia, Pa.
Steinhoff, F., Chicago, Ill.
Stephani, W. J., Crum Lynne, Pa.
Stephenson, H. H., Montreal, Can.
Stephenson, L. L., Birmingham, Ala.
Stone, C. H., Jr., Rome, Ga.
Stull, R. T., Savannah, Ga.
Swan, S. D., New York, N. Y.
Tailby, R. V., Matawan, N. J
Tucker, G. M., Long Island City, N. Y.
Turner, Eric W., Trenton, N. J.
Underwood, C. A., Boston, Mass.
Watkins, Joel H., Charlotte, C. H., Va.
Weber, K. B., Astoria, L. I.
Weigel, W. M., Washington, D. C.
Whitaker, F. A., Keasby, N. J.
White, A. T., Dover, N. J.
Wikoff, A. G., New York, N. Y.
Will, Otto W., Metuchen, N. J.
Williams, J. L., Metuchen, N. J.
Young, G. A., Bloomfield, N. J.

NOTES AND NEWS

THE REFRACTORIES OPERATIVE INSTITUTE

By Frederic W. Donahoe[1]

Some six years ago, in an annual meeting of The Refractories Manufacturers Association, Mr. Richard D. Hatton, of St. Louis, then president of the Association, urged the adoption of a functionalized group plan, whereby the best practice existing in the manufacture, administration and accounting methods and in the sale of refractories would be established through the development of so-called institutes, in which those directly in charge of the various departments would be the active members and officers.

[1] Secretary, The Refractories Manufacturers Association.

The seed thus sown took root, but no signs of growth were apparent for about three years. In 1920, the Association voted to establish an Institute in which the men and women employed in the accounting departments of the members of the Association could be brought together, given an appropriation and left, as it were, to demonstrate the wisdom of a semi-independent organization. The success of the Refractories Accountants Institute led to the next step, which was taken during the latter part of 1922, when a committee was appointed to organize a Refractories Operatives Institute in which key-men, actively engaged in the various processes of manufacture at the plants of the members of the Association, would be brought together and led to the discussion of problems common to them all.

At the outset it was thought that the Refractories Operatives Institute should be national in scope and include operating men from coast to coast. The organization

Kentucky-Southern Ohio District Refractories Manufacturers Association, Operators Institute Meeting, Hayward, Ky., Aug. 17, 1923.

committee, however, decided that this would limit the number of meetings to one (or perhaps two) a year and as a consequence a policy was adopted which opened the way for the establishment of branches in every clay fire brick producing district in the country. When these branches are all functioning, the project of a national meeting will be given due consideration.

The first branch was started in the Southern Ohio-Kentucky field at a meeting held at Ironton, Ohio, on January 23, 1923. Shortly after that, a branch was started in Pennsylvania, a meeting being held at Pittsburgh on February 14. A third branch got off to a flying start on August 23, at New York, those in attendance being operating men employed by refractories manufacturers owning plants in New York, New Jersey and New England.

Southern Ohio-Kentucky Branch

Thirty-one operating men connected with fifteen companies owning plants in the Southern Ohio-Kentucky field constitute the membership. They have held seven meetings and plan to hold one each month from now on. The average attendance so far,

has been twenty-one. Papers have been read and discussions had on the following subjects:

Modern Methods of Insulating Periodic Kilns
Machine Made Fire Brick with Special Reference to Steam Lubrication
Drying—on Hot Floors, in Tunnel Dryers and in Kilns
Setting Kilns—with Special Reference to Differentiation between Hand Made and Machine Made Brick
Heat Losses in the Burning of Clay Fire Brick
Suggestions on the Fine Points of Molding
The Disposition of Water Smoke in the Initial Stages of Burning

In addition to the formal papers above listed, informal talks have been given on a wide range of subjects, many of which have covered personal experiences in overcoming manufacturing difficulties that are more or less common to all fire brick plants.

Pennsylvania-Maryland-West Virginia Branch

Despite the fact that the plants in this district outnumber those in Southern Ohio-Kentucky by more than three to one, the membership of the Pennsylvania-Maryland-West Virginia Branch of the Refractories Operatives Institute is smaller and much less active. Twenty-three members have held four meetings in all, with an average attendance of fifteen.

The work done has been more in the nature of general discussions on questions selected by a "steering committee" than the following of formal papers. Among the questions that have been taken up and either disposed of or carried over for reports to be later made by committees appointed for that purpose, are:

Should the time of grinding be left to the judgment of the pan-tender or should there be a definite time limit set?
Should the amount of water used in the mix be left to the judgment of the pan-tender or should the water be accurately measured? What are the best measuring devices for this purpose?
What is the relative importance of the different piece-workers in the manufacture of fire brick? Are the piece-workers of the same relative importance giving approximately the same amount of labor to accomplish a day's work?
Is the refractories industry training a sufficient number of young men as molders and pressers to maintain the present rate of output on hand-made brick and shapes?
What is the most economical wood to use for molds?
What are the causes for the existing variation in the size of 9-inch straight brick?

Formal papers have been presented and discussed on the following subjects:

Control and Reduction of Floor Breakage
Compensation Insurance
Benefits of Grog (calcined clay) in Mixes
Daily Labor Cost Reports.

New York, New Jersey and New England Branch

This branch has fourteen members and has held but one meeting, at which six members were present. Its present purpose is to hold four meetings a year.

Branches are being organized in Missouri and in Colorado. As in the case of the branches now functioning, the first meeting will be attended by one of the members of the Association's committee, which consists of Mr. E. M. Weinfurtner, of Ashland, Ky., Mr. George H. Diack, of Lock Haven, Pa. and Mr. Samuel M. Kier, of Salina, Pa. Each branch has its own Constitution and By-Laws, elects its own officers and is self-supporting.

OHIO STATE FELLOWSHIPS NAMED

The three fellowships made available at the Ohio State University in coöperation with the U. S. Bureau of Mines have been filled. The following men together with the investigation to be undertaken have been chosen by the committee in charge.

A. J. Andrews—The fabrication of dolomite refractories.

J. G. Phillips—Volume changes occurring in fire clay refractories during the burning.

F. T. Heath—Subject to be chosen.

Each of these men is a candidate for his doctorate. Messrs. Phillips and Heath in Ceramics and Mr. Andrews in Chemistry. The work is being carried out in the laboratories of the Bureau and under the co-direction of the Superintendent of the Bureau and the head of the Department in which the incumbent is a candidate for a degree.

FRANK H. RIDDLE IN EUROPE

Frank H. Riddle, former president of the AMERICAN CERAMIC SOCIETY (1922–23) will sail for France on the "S. S. Leviathan," in November. Mr. Riddle will present a paper before the International Conference on Insulators which will be held in Paris on November 26. The subject of the paper will be "Relation between the Composition, Micro-Structure and the Physical Properties of Porcelain."

The trip will be made in the interests of the Champion Porcelain Company and the Jeffery-Dewitt Insulator Company and while in France he will do some advisory work for the Compagnie General D'Electric Ceramique, one of the largest ceramic manufacturers in France.

This firm recently completed a modern plant equipped with tunnel kilns to manufacture special thick insulators under Jeffery-Dewitt patents.

Mr. Riddle will also visit other plants, not only in France but in other European countries.

On September 13, Mr. Riddle gave a talk in Cincinnati on the manufacture of electrical porcelain for high tension insulators at a meeting of the local section of the American Institute of Electrical Engineers.

RESEARCH ON DRY PRESSING OF AMERICAN TALC

The American Lava Corporation of Chattanooga, Tenn., has entered into a coöperative agreement with the department of the Interior, U. S. Bureau of Mines, whereby a study of dry pressing of American talcs will be made. Under the terms of the agreement the Bureau will study methods of proper beneficiation of the talc as well as fabrication of the ware.

R. M. King is employed directly in the laboratory and field work, which is under the director of the Columbus Station of the Bureau.

ELLSWORTH OGDEN LEAVES BUREAU OF MINES

Ellsworth Ogden has severed his connection with the Columbus Station of the U. S. Bureau of Mines as Ceramic Engineer to go with the Lavino Refractories Company of Philadelphia, Pa. Mr. Ogden, while with the Bureau, was connected with the survey of burning conditions on refractory plants and will serve the Lavino Company in a similar capacity.

This is another of the oft repeated cases where the industry avails itself of the excellently trained men who have received experience along a special line in the government service.

INTERNATIONAL CRITICAL TABLES OF NUMERICAL DATA ON PHYSICS, CHEMISTRY AND TECHNOLOGY

Prepared under the Auspices of the International Research Council

The Board of Editors of *International Critical Tables* met in Washington, D. C., August 16 for three days to select coöperating experts who will be invited to assume responsibility for critically compiling the various classes of data. It is estimated that four hundred coöperating experts will be needed. Selection will be made largely on the basis of recommendations received from the corresponding editors and their Advisory Committees from the principal countries of the world.

Invitations to act as coöperating experts will be issued from the editorial office as fast as action is taken by the Board. From responses thus far received a full measure of coöperation is expected from the chemists and physicists of the world.

In dividing the subject matter for assignments the Board has endeavored to make each of such a magnitude that it can be reasonably completed in a year's time without proving too great a burden upon any expert.

International Annual Tables is now in its 12th year. It has demonstrated the possibility of preparing through international coöperation an annual abstract of the results of the world's researches in quantitative measurement. The purpose of *International Critical Tables* is to take an account of stock of our present quantitative knowledge of material things and to publish in convenient form the result of expert criticism of this knowledge.

The International Union of Pure and Applied Chemistry and the International Research Council have given the weight of their authority and influence to *International Critical Tables.* American industries will supply the necessary funds. It remains only for the scientists of the world to contribute their time, money and expert knowledge to insure the successful completion of the undertaking. Science itself is international.

If the results of scientific research are to be utilized most efficiently they must first be made easily accessible. To make these results accessible so that they may be utilized to the best advantage is as much the duty of men of science as are the researches which produce them and the task of rendering these results readily accessible requires the coöperation of the same types of expert knowledge as have been employed in producing them.

Organization of International Critical Tables

Board of Trustees

(in charge of financial matters)
Chairman, George P. Adamson
Secretary, William M. Corse
Harrison E. Howe
Hugh K. Moore
Charles L. Reese
Julius Stieglitz
Edward B. Craft

Board of Editors

Editor-in-chief, Edward W. Washburn
Associate Editors, Clarence J. West, N. Ernest Dorsey

Members of the Board

George K. Burgess
Saul Dushman
John Johnston
C. E. K. Mees
C. E. Mendenhall
R. B. Moore

Associate Editors and Special Editors

Joseph Pelc, Special Table of Organic and Inorganic Substances
F. R. Bichowsky, Thermochemical Data
Walter Rosenhain, Metals and Alloys

THE BUREAU OF STANDARDS WANTS COÖPERATION

Tests Applied to Drying Properties of Clay

By G. K. Burgess[1]

The Bureau of Standards has developed a series of tests applied to the drying properties of clays. In order to have this work include a wide range of materials and to become of general practical use manufacturers are urged to submit for test clays in use at their plants. It will be desirable to receive a variety of clays, those which have the best drying characteristics as well as those which offer difficulty in drying.

Clays submitted should be accompanied by the following information:

1. Kind.
   (a) Surface clay
   (b) Shale
   (c) No. 1 or No. 2 fire clay.

2. Articles manufactured.
   (a) Hollow tile
   (b) Sewer pipe
   (c) Brick (paving or building).

3. Drying treatment in plant.
   (a) Type of drier
   (b) Time required to dry
   (c) Temperatures in drier (if tunnel drier at hot end).

4. Difficulties experienced.
   Extent of loss of ware.

The tests to which the clays will be subjected will include the following:

1. Average water of plasticity.
2. Drying shrinkage at 110°C.
3. Safe and ideal rate of drying stated either in per cent of moisture loss per hour or, if the weight relative to the exposed area of the manufactured pieces be given, the time can be stated in hours, with the proper temperature, humidity and air circulation to be maintained.
4. Rate of drying shrinkage compared to loss in moisture and the stage of drying at which shrinkage is complete.
5. Strength of the unfired piece.
6. If desirable, dry porosity and the moisture diffusion constant can be given; however, these factors are related and applied in the drying rate under No. 3.

It is expected, from this work, that it will be possible to recommend improvements in drying treatment and to overcome difficulties now current in the handling of many materials. It will also be possible to give data on new materials, predicting their drying behavior in commercial driers.

The manufacturers can aid largely in this work by immediately submitting samples of their raw material together with full details of character and treatment, as previously outlined.

PACIFIC NORTHWEST CLAYWORKERS' ASSOCIATION

The summer meeting of the Pacific Northwest Clayworkers' Association[2] was held at the Northern Clay Company, Auburn, Washington Saturday afternoon and evening, August 25th. The program covered a series of papers on Driers and Drying Clay Products, as follows:

[1] Director, Bureau of Standards.
[2] Hewitt Wilson, Secretary.

1. Clay and Water—Marriage and Divorce. Hewitt Wilson, Ceramic Department, University of Washington, Seattle.
2. Commercial Drying Methods and Dryers for Clay Wares. W. E. Lemley, General Superintendent, Denny Renton Clay and Coal Co., Seattle.
3. The Martin Steam Pipe Rack Brick Drier and the Boss Drying System. Samuel Geijsbeek, Geijsbeek Engineering Company, Seattle.
4. The New Double Deck Brick Drier at the Builder's Brick Company. F. T. Houlahan, Seattle.
5. The Carrier Humidity Drier for Terra Cotta. Demonstration. Paul S. MacMichael and A. Lee Bennett, Northern Clay Company.
6. Heat Losses and Control or Where Your Money Goes. Hewitt Wilson.
7. The Manufacture of Refractories. The new film of the U. S. Bureau of Mines was shown at one of the local moving picture houses.

Over forty men from Oregon and Washington attended the meeting and were treated to a magnificent dinner at one of the Auburn restaurants at the expense of the Northern Clay Company.

This is the third meeting of the Association this year. In fact the Association was only organized January 20th, 1923 and already there is a membership of over fifty.

At the next meeting, tentative date January 20, 1924, the question of Kilns and Methods of Firing will be discussed.

SUMMARIZED REPORT OF HOTEL CHINAWARE CONFERENCE

At the request of a joint committee of the American Hotel Association and the American Vitrified China Manufacturers Association, the Department of Commerce arranged a general conference of hotel men, potters, government representatives and others interested, on May 28, 1923, at Washington, D. C., to consider constructive eliminations of excess sizes and varieties of hotel chinaware. Interest in applying Simplified Practice to this commodity originated in an address by Mr. A. Lincoln Scott, representing the Research Bureau of the American Hotel Association, before the annual convention of the American Ceramic Society at Pittsburgh.

Following Mr. Scott's presentation, the Society endorsed a program for Simplification and asked a committee from the Research Bureau of the Hotel Association to meet with the American Vitrified China Manufacturers Association at the Hotel Astor, New York, April 10, 1923. Here Mr. Scott especially emphasized the simplification of chinaware from the hotel standpoint and the manufacturers adopted a resolution authorizing the appointment of a committee to work with a similar group from the Hotel Association, and further authorized the appointment of an industrial engineer to coöperate with an engineer from the Hotel Association Research Bureau.

On May 7, a joint meeting of these committees was held at the Hotel McAlpin, New York, where Mr. A. E. Foote, of the Division of Simplified Practice, presented the available service of the Department of Commerce and illustrated with lantern slides accomplishment in many similar lines. From this last meeting was developed the General Conference of May 28, with personnel as detailed in the accompanying list. Some 700 samples of hotel chinaware, representatives of 200 variations commonly merchandized were before the meeting, and after thorough discussion the conference crystallized its unanimous opinion in the following resolutions and the recommendation now issued in tentative form as Simplified Practice Recommendation No. 5 of the Department of Commerce:

WHEREAS the Vitrified China Manufacturers' Association in coöperation with the American Hotel Association and other interested representatives have met with and at the invitation of the Secretary of Commerce and the chief of the Division of Simplified Practice for the purpose of considering the simplification of hotel chinaware in the interests of economy, be it

Resolved that as a step towards the elimination of excess varieties of hotel chinaware, the Vitrified China Manufacturers' Association, in coöperation with the American Hotel Association, hereby recommends the establishment of the sizes and varieties as standard for hotel use, as shown on the attached list:

Furthermore, be it *Resolved* that the Vitrified China Manufacturers' Association and the American Hotel Association hereby commend the constructive coöperation of the Division of Simplified Practice of the Department of Commerce, in lending its assistance to our effort to eliminate waste through the reduction of variety in hotel chinaware, and likewise commend the Chamber of Commerce of the United States for the helpful service rendered in this connection.

TABLE I

SIMPLIFIED PRACTICE RECOMMENDATION NO. 5
HOTEL CHINAWARE

In accordance with the unanimous action of the joint conference of all interests concerned with Hotel Chinaware, personnel as shown in the accompanying list, the U. S. Department of Commerce recommends that the recognized sizes and varieties of this commodity be restricted to the following:

Roll edge list	Trade size	Actual size	Tolerance
Plates	4″	6 1/4″	1/8″
Plates	5″	7 1/8″	1/8″
Plates	6″	8 1/8″	1/8″
Plates	7″	9″	1/8″
Plates	8″	9 5/8″	1/8″
Plates, Rim Soup	5″	7″	1/8″
Plates, Rim Soup	7″	9″	1/8″
Plates, Coupe, Soup	6″	7 1/2″	1/8″
Plates, Individual butter	2 1/2″	3 1/2″	1/8″
Dishes, oval, platters	4″	7″	1/8″
Dishes, oval, platters	6″	9 1/8″	1/8″
Dishes, oval, platters	8″	11 1/4″	1/4″
Dishes, oval, platters	10″	13 1/4″	1/4″
Dishes, oval, platters	12″	15 1/8″	1/4″
Bakers, vegetable dishes	2 1/2″	5 1/4″	1/8″
Bakers, vegetable dishes	3″	5 3/4″	1/8″
Bakers, vegetable dishes	5″	7 1/4″	1/8″
Bakers, vegetable dishes	8″	10″	1/8″
Boats (sauce)	Large	11 oz.	1/4 oz.
Boats (sauce)	Medium	5 oz.	1/8 oz.
Boats (sauce)	Small	3 oz.	1/8 oz.
Bowls, Ftd	30's	5 3/4 oz.	1/8 oz.
Bowls, Sugar	No. 2	12 oz.	1/2 oz.
Bowl, salad	No. 1	11 1/8″	1/8″
Bowl, salad	No. 3	9 1/2″	1/8″
Bowl, salad	No. 4	8 1/4″	1/8″

Bowl, salad	No. 5	7″	$^1/_8$″
Bowl, salad	No. 6	$6^1/_8$″	$^1/_8$″
Cups, Bouillon, Huber	....	$7^1/_2$ oz.	$^1/_8$ oz.
Cups, Bouillon, Boston	2 B H	$7^1/_2$ oz.	$^1/_8$ oz.
Cups, Coffee, Huber	....	$9^1/_2$ to 10 ozs.	...
Cups, Tea, Huber	....	7 to 8 ozs.	...
Cups, Tea, Boston	....	$7^1/_2$ oz.	$^1/_4$ oz.
Cups, Extra Tea, Boston	....	$8^1/_2$ to 9 ozs.	...
Cups, Egg, Wheat, Unhd	....	$6^1/_2$ oz.	$^1/_2$ oz.
Cups, Coffee, Saxon A. D.	....	$3^5/_8$ oz.	$^1/_8$ oz.
Saucers, Coffee, A. D. (To match cups)	....	$4^7/_8$ oz.	$^1/_8$ oz.
Cake Cover	....	$6^1/_4$″	$^1/_8$″
Celery Tray, oval	No. 1	12″	$^1/_8$″
Celery Tray, oval	No. 22	10″	$^1/_8$″
Celery Tray, oval	No. 3	$7^5/_8$″	$^1/_8$″
Celery Tray, oval	Fancy	11″	$^1/_8$″
Creams, No. 1 Tankard Hd or Unhd	....	$1^3/_4$ oz.	$^1/_4$ oz.
Dishes, Fruits, coupe shape	3″	$4^1/_8$″	$^1/_8$″
Dishes, Fruits, coupe shape	$3^1/_2$″	$4^3/_4$″	$^1/_8$″
Dishes, Fruits, coupe shape	4″	$5^3/_8$″	$^1/_8$″
Dishes, Fruits, coupe shape	$4^1/_2$″	$5^3/_4$″	$^1/_8$″
Dishes, Ice cream	4″	$4^1/_8$″	$^1/_8$″
Dishes, Grape Fruit	....	6″	$^1/_8$″
Dishes, Pickle, oval	....	$8^3/_4$″	$^1/_8$″
Jugs	6's	$5^1/_2$ to $6^3/_4$ pts.	...
Jugs	12's	$3^1/_2$ to 5 pts.	...
Jugs	24's	3 to $3^1/_2$ pts.	...
Jugs	36's	1 to $1^1/_4$ pts.	...
Jugs	42's	$^3/_4$ pts.	...
Jugs	48's	5 to 6 ozs.	...
Jugs, Hall Boy Pitcher	24's	$2^3/_4$ pts.	$^1/_2$ pts.
Mustard Pots, Vienna Unhd	No. 1	$4^1/_2$ oz.	$^1/_2$ oz.
Nappies	3″	5″	$^1/_8$″
Nappies	4″	$5^3/_4$″	$^1/_8$″

For government service the above list of shapes are required plus the additional shapes listed below

Jug Pitcher	5's	8 pts.	$^1/_2$ pt.
Jug Cream	54's	$4^1/_2$ oz.	$^1/_2$ oz.
Sugar Bowl, individual	....	5 oz.	$^1/_4$ oz.
Egg Cup, double	....	4 oz.	$^1/_8$ oz.
Sugar Bowl	No. 1	17 oz.	1 oz.
Coffee Pot, individual	....	12 oz.	1 oz.
Pin tray	....	$5^1/_4$″	$^1/_8$″
Casserole, plain	8″	$2^3/_4$ to 3 pts.	...
Match stand round hooded	....	$6^1/_2$″	$^1/_2$″
Ice Tub	....	$9^1/_4$ pts.	$^3/_4$ pt.

It is further recommended that the recognized items be made in three weights only, as covered by the trade names "ROLLED EDGE," "MEDIUM WEIGHT" and "LIGHT WEIGHT," respectively.

Approved subject to regular annual review in conference with the Central Committee of the Industry.

HERBERT HOOVER
Secretary of Commerce

July 1, 1923

Personnel of Chinaware Conference

POTTERS' REPRESENTATIVES

Bown, Lew H., Buffalo Pottery, Buffalo, N. Y.
Goulding, A. L., Warwick China Co., Wheeling, W. Va.
Huber, Wm. L., Onondaga Pottery Co., Syracuse, N. Y.
Mayer, Arthur E., The Mayer China Co., Beaver Falls, Pa.
Purdy, Ross C., American Ceramic Society, Lord Hall, O. S. U., Columbus, O.
Read, Charles W., Shenango Pottery Co., New Castle, Pa.
Sutterlin, Frederick, Maddock Pottery Co., Trenton, N. J.

HOTEL REPRESENTATIVES

Dyer, Herbert A., Hotel Biltmore, New York City—Amer. Hotel Assn.
Gillis, Geo. M., 1410 M St., The New Willard, Washington, D. C.
Hight, Frank S., The New Willard, Washington, D. C.
Scott, A. L., American Hotel Association, Chicago, Ill.
Scofield, Franklin D., American Hotel Association, Hotels McAlpin and Martinique, New York City.

FEDERAL REPRESENTATIVES AND MISCELLANEOUS DISTRIBUTORS

Bates, P. H., Bureau of Standards, Washington, D. C.
Bentley, U. S. A., Captain Geo. A., Room 2214 Munitions Bldg., War Department, Washington, D. C.
Brown, F. C., Bureau of Standards, Washington, D. C.
Edwards, Lt. Comdr. E. C., Room 1105 Navy Bldg., Washington, D. C.
Harrison, A. J., U. S. Veterans Bureau, Rm. 736, Arlington Bldg., Washington, D. C.
Hazelwood, F., Bureau of Standards, Washington, D. C.
Holden, P. E., Fabricated Production Dept., C. of C. of U. S., Washington, D. C.
Kidd, R. C., Federal Specifications Board, U. S. Veterans Bureau, Washington, D. C.
Kinsey, R. D., U. S. Public Health Service, 1211 13th St. N. W., Washington, D. C.
Puryear, Major B., Jr., U. S. Marine Corps, Navy Bldg., Washington, D. C.
Sortwell, H. H., Trenton, N. J.
Williams, Arthur E., Bureau of Standards, Washington, D. C., Chairman, Federal Specifications Board.

DIVISION OF SIMPLIFIED PRACTICE

Foote, A. E., Division of Simplified Practice, Department of Commerce, Washington, D. C.
Gately, Wm. A., Department of Commerce, Washington, D. C.

PROF. PARMELEE RECEIVES APPOINTMENT

Professor C. W. Parmelee has been made Head of the Department of Ceramic Engineering at the University of Illinois. He has been connected with the institution since 1916 as Professor of Ceramic Engineering and during the past year served as Acting Head.

CALENDAR OF CONVENTIONS

Organization	Date	Place
AMERICAN CERAMIC SOCIETY (Annual Meeting)	Feb. 4–8, 1924	Atlantic City
American Concrete Institute	Feb. 25–28, 1924	Chicago
American Face Brick Assn.	Dec. 4–6, 1923	French Lick Springs, Ind.
American Face Brick Assn. (Southern Group)	Nov. 1923	West Baden, Ind.
American Malleable Castings Assn.	Jan. 1924	Cleveland, Ohio (?)
American Road Builders' Assn.	Jan. 14–18, 1924	Chicago
American Trade Assn. Executives	Oct. 24–26, 1923	Chicago
American Zinc Institute	May, 1924	St. Louis
Assn. of Scientific Apparatus Makers of U. S. A.	April 18, 1924	Washington, D. C.
Common Brick Mfrs. Assn. of America	Feb. 11, 1924	Los Angeles, Calif.
Gas Products Assn.	Jan. 1924	Chicago
Hollow Bldg. Tile Assn.	Jan. 1924	Chicago (?)
Natl. Assn. of Stove Mfrs.	May 7–8, 1924	New York, Hotel Astor
Natl. Brick Mfrs. Assn.	Feb. or Mar. 1924	
Natl. Builders Supply Assn., Inc.	Feb., 1924	Chicago (?)
Natl. Electric Light Assn.	May or June, 1924	
Natl. Glass Distributors Assn.	Dec. 4–5, 1923	Pittsburgh, Pa.
Natl. Paving Brick Mfrs. Assn.	Dec., 1923	
Portland Cement Assn.	Nov. 19–21, 1923	New York
Stoker Mfrs. Assn.	Oct. 25, 1923 (?)	
U. S. Potters Assn.	Dec., 1923	Washington, D. C. (?)

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings
of the Society, Discussions of Plant Problems, Discussions
of Technical and Scientific Questions and
Promotion of Coöperative Research

Vol. 2 — November, 1923 — No. 11

EDITORIAL

INDEBTEDNESS

An honest and honorable person abhors indebtedness unless there is profit to be gained in its assumption and payment. Each person owes to self and to others certain obligations which, if not acknowledged and discharged, become abhorent.

No service is rendered for which a compensation of some sort is not due. Those who receive service, whether wittingly or otherwise are obligated to pay the compensation which that service has made due. The welfare of man in all particulars is dependent on the extent and promptness with which these obligations are recognized and discharged.

How about indebtedness to one's fellow men and to society in general? Is a person obligated to his city, state and nation; to his posterity? To the point of this editorial—has a person an obligation to his profession or to his industrial fellow that is not a basic obligation to self?

Each person in a community profits from a strong, virile and progressive government, school and church. The K. of C., the Y. M. C. A., and the many social, religious, and educational institutions have made living more pleasant and profitable to each and every person. It is profitable alike to the childless and to the parent that good schools are maintained. It is beneficial to each person that no money or effort be spared to keep well

and alive every human being. For all of these benefits each person is obligated to pay his quota in support of the means employed.

How about one's interests and obligations in the welfare of his industrial fellows? Does it profit a person who is engaged in ceramic work to maintain strong and virile educational institutions devoted exclusively to the ceramic arts and sciences?

Those who are informed of the facts know that the ceramic industries as a whole and that each firm or corporation separately have profited and continues to profit a great deal from the researches reported through the AMERICAN CERAMIC SOCIETY and from the gathering together in its conventions for the purpose of discussing technical plant problems. This SOCIETY is an organized corporation and a membership implies an obligation to coöperate for mutual profit, but this obligation rests with all ceramic workers and firms in as much as the profits do actually accrue to all.

The Program Committee has issued a call for contributions to the convention program. This is an opportunity for each member to discharge the obligation he owes to his fellows on account of the hundreds of valuable contributions which have been given by others during the past twenty-six years. This opportunity is not for an exclusive few; it is for all members.

The Membership Committee has drawn attention to the opportunity to serve self by inviting others to join this coöperative educational enterprise. The SOCIETY does not need joiners, but it does need an extension of its opportunities for service and the opportunity and strength to make its services of more value to each member. These larger opportunities for service can be had only through a larger membership.

President Greaves-Walker, Messrs. Zopfi, Flint, Riddle and others have drawn to the attention of corporations their opportunity for self service in corporation memberships by thus making possible and more effective these organized educational opportunities to their employees.

The obligation of each ceramist and of each ceramic concern is obvious The AMERICAN CERAMIC SOCIETY is the agency through which these obligations may most easily and most effectively be discharged.

The convention program—the membership invitation—the corporation membership support—the perpetual membership endowments—these are opportunities for discharging the indebtedness you owe to yourself and to your fellow ceramists.

ACTIVITIES OF THE SOCIETY

PRESIDENT'S PAGE

We have reached the crucial point in the year so far as our finances are concerned. From this time until the first of the year when the 1924 dues begin to come in the outgo will exceed the income.

When the Budget Committee decided last year to lay out a program calling for an expenditure of $40,000 they foresaw the necessity of drawing upon the last of our financial reserves to make up a certain deficit. Every business man knows, however, that additional investment is always necessary to enlarge a business and the Budget Committee decided to invest in order to enlarge and extend the SOCIETY.

That their decision was wise is now beyond doubt, as this year will prove to be the greatest in the history of the SOCIETY both as to growth and accomplishments.

Every effort must be made by every member to increase the membership and advertising, the only two sources of income that can help us during the balance of the year to reduce the deficit.

Next year we must budget at least the same amount as this year if not more. The time has arrived when the SOCIETY should have an Editor so as to release the Secretary for the tremendous amount of work that lies before him. This would mean an additional $3000 or $4000 per year, but it would be worth all we put into it.

* * *

Splendid response has been received from the various committees and the real work of the year has begun. Difficult as it is to carry on committee work, much can be accomplished by a live chairman and it is to these chairmen we are looking for results before February 1st.

* * *

Have you thought of taking out a perpetual personal membership? Many members can easily afford the $200 fee and it would be a splendid thing to be among the first to contribute to the SOCIETY'S endowment.

* * *

In addition to the splendid entertainment given the members at the Summer Meeting the Detroit Section has put itself decidedly on the SOCIETY'S map by holding a large and successful meeting at which many members of other technical and engineering societies were present. I know it will give every member pleasure to know that another Section has been so successfully launched.

NEW MEMBERS RECEIVED FROM SEPTEMBER 15 TO OCTOBER 15

PERSONAL

A. R. Anderson, 607 Int. Southern Bldg., Louisville, Ky., President Kentucky American Clay Company.

J. Antonio de Artigas, 4 Arrieta, Madrid, Spain, Scientific Glass Laboratory.

John Betteley, 314 Fielding Ave., Ferndale, Mich., Clay Inspector and Thrower.

W. A. Darrah, 79 W. Monroe St., Chicago, Ill., Consulting Engineer.

George E. Ford, 50 Church St., New York, N. Y., District Sales Manager, A. P. Green Fire Brick Company.

Pierce W. Ketchum, 203 Ceramics Bldg., University of Illinois, Urbana, Ill., Research Graduate Assistant.

William H. Leary, 907 E. 75th St., Chicago, Ill., Advance Pyrometer Service Company.

George W. Lester, 2176 McClellan Ave., Detroit, Mich.

Robert Macdonald, Jr., General Abrasive Company, Niagara Falls, N. Y., Metallurgist.

Frank Cameron Schultz, 348 Chittenden Ave., Columbus, Ohio (Student Member).

E. L. Simpson, 20th and State St., East St. Louis, Ill., Production Engineer, American Range and Foundry Company.

George A. Speer, 116 Hyland Ave., Ames, Iowa (Student Member).

S. D. Swan, 220 West 42nd St., New York, N. Y., Research Chemist, The Dentist's Supply Company.

Marion I. Walter, 3226 Warder St., N. W., Washington, D. C., Ceramic Division, U. S. Bureau of Standards.

Guy A. Young, 33 Elmwood Ave., Bloomfield, N. J., Engineer, Capstan Glass Company.

CORPORATIONS

Crane Enamelware Company, Chattanooga, Tenn., H. W. Powell, Gen. Mgr.

Wishnick Tumpeer Chemical Company, 365 E. Illinois St., Chicago, Ill., Michael Agazim, President.

Membership Committee boosters have the following record:

Name	Personal	Name	Personal	Corporation
E. N. Bunting	1	Henry J. Mitchell	2	
Edward Burkhalter	1	D. A. Moulton	1	
G. W. Cooper	1	James T. Robson	1	
H. D. Foster	1	H. E. Davis		1
H. S. Kirk	1	Office	5	1
John J. Maroney	1		—	—
			15	2

No resignations, Net Gain 17

Personal	Corporation	Total Roster Oct. 15
1862	254	2116

PERSONAL NOTES OF SOCIETY MEMBERS

M. G. Babcock, formerly sales representative of the Laclede-Christy Clay Products Company has succeeded P. M. Offill in charge of their Pittsburgh office.

George A. Balz has asked that his address be changed from Rahway, N. J., to Perth Amboy, N. J.

Harry Barkby, formerly manager of the Chelsea China Company, New Cumberland, W. Va., has a similar position with the Warwick China Company, Wheeling, W. Va.

Charles E. Bates has taken a position with the Beaver Falls Art Tile Company, Beaver Falls, Pa. Mr. Bates was previously with the National Fire Proofing Co., of Perth Amboy, N. J.

A. G. C. Breese has moved from Bridgeton, N. J., to 135 Bridge Street, Manchester, Mass.

Trevor Caven, who has been consulting engineer with the Quigley Furnace Specialties Company is now located at 564 W. 173rd St., New York, N. Y.

Sanford S. Cole, formerly of Hornell, N. Y., is now located at 203 Ceramics Bldg., Urbana, Illinois.

R. R. Danielson, Secretary of the Enamel Division of the AMERICAN CERAMIC SOCIETY, has returned to the Bureau of Standards, Washington, D. C., having resigned his position with the Beaver Enameling Co., Ellwood City, Pa.

Redfield Dinwiddie, until recently ceramist for the Babcock and Wilcox Co., East Liverpool, Ohio, is now living in Somerville, N. J.

A. H. Fessler has accepted a position as manager of the Hamilton Clay Manufacturing Company, Hamilton, Illinois. Mr. Fessler has been with the U. S. Bureau of Mines on the laboratory car "Holmes."

G. M. Galvin, recently of the U. S. Naval Fuel Oil Testing Plant, Navy Yard, Philadelphia, Pa., is now with the Jointless Fire Brick Company, Trenton, N. J.

T. W. Garve has moved from Brazil, Ind., to Washington, Pa. Mr. Garve is employed with the Findlay Clay Pot Company.

Robert E. Gould, formerly of Columbus, Ohio, is now living at 512 E. 2nd Street, Flint, Mich.

Ralph E. Hanna has moved from 149 Rector Street, to 272 McClelland Street, Perth Amboy, N. J.

M. E. Holmes has taken a position with the United States Gypsum Company, 205 West Monroe St., Chicago, Illinois. Mr. Holmes has been manager of the chemistry department of the National Lime Association, Washington, D. C.

Karl M. Kautz, 1923 graduate in ceramics, Ohio State University, is now with the American Range and Foundry Company, St. Louis, Mo.

J. H. Knote, whose address has been unknown for some time has notified the Secretary's office that he is with the J. H. Gautier Co., Jersey City, N. J.

Raymond B. Ladoo, of the Southern Minerals Corporation who has been located at the Washington, D. C. office will have his headquarters during the winter at Cleveland, Tenn.

Walter T. Lippert has moved from Alton, Ill., to 85 North Laurel St., Bridgeton, N. J.

G. F. Metz, sales manager of the Hardinge Company has been transferred from the New York office to York, Pa.

L. V. Reese is now corporation representative for the U. S. Metals Refining Company, taking the place of Francis R. Pyne who has left that company.

L. M. Richard has moved from Ocean Park, Calif., to 1032 7th St., Santa Monica, Calif.

Malcolm A. Schweiker, general manager of the Empire Floor and Wall Tile Company of New York City is now located at the Worcester, Pa., office.

W. L. Shearer, of the Ceramic Division, Bureau of Standards, Washington, D. C., has accepted a position as instructor in the Department of Ceramics at Rutgers College, New Brunswick, N. J.

George C. Swift has moved from 2029 E. 115th St., to 1031 Greyton Rd., Cleveland, Ohio.

Royal W. Taylor, of the Canton Stamping and Enameling Company, has moved from 707 12th Street, N. W., to 1415 Arnold Ave., N. W., Canton, Ohio.

Robert Twells, Jr. has moved from Highland Park, Mich., to 309 Ardmore Drive, Ferndale, Mich.

C. A. Underwood, formerly of the General Refractories Company, is now with the Queen's Run Refractories Co., Inc., 141 Milk St., Boston, Mass.

Ernest W. Westcott has left the Niagara Falls Alkali Company as Research Engineer and is now with Kalmus, Comstock and Westcott of Niagara Falls, N. Y.

Stefan Wiester has moved from Belleville, Illinois, to 1903 S. 4th Street, Ironton, Ohio.

A. E. Williams, Secretary of the Glass Division, AMERICAN CERAMIC SOCIETY, has left the Bureau of Standards, Washington, D. C., and is located in Elmira, N. Y., with the Thatcher Manufacturing Company.

ORGANIZATION OF DETROIT SECTION

BY H. F. ROYAL

At the request of A. F. Greaves-Walker a section of the AMERICAN CERAMIC SOCIETY for the Detroit district has been organized by Frank H. Riddle. When the organization of this section was contemplated it was realized that a large, very active section could not be built up by appealing solely to the members in the Detroit district, because these members are too widely scattered. A large, active section could be assured through discussions of vital and general interest to Detroit's gigantic industries. The subject of most interest clearly was refractories.

The Detroit district uses millions of fire brick yearly and many Detroit plants are engaged in writing specifications for the purchasing of refractories. It was decided, therefore, to have as the subject for discussion at the first meeting "Specifications for Refractories." A. V. Bleininger kindly agreed to deliver the address on this subject.

A banquet preceded the first meeting held on October 4 and eighty men responded to the several hundred notices which were sent out. Mr. Riddle acted as temporary chairman. The Kentucky Fire Brick Manufacturers' Association was represented and men were present from many of the large plants including the Ford, Dodge Brothers, Cadillac, Hudson, Maxwell, Packard, Timken Axle plants and others; the Detroit Edison and Detroit City Gas Companies were well represented; Professors Peck and Kraus of the Mineralogical Department were present; five members of the SOCIETY came from Flint and Mount Clemens; and fifteen men were present representing various sales offices in the district. The sales offices and manufacturers' representatives displayed a great interest in the meeting and were responsible for the presence of several interested men.

Mr. Riddle outlined the aims of the SOCIETY and the purposes in view in the formation of a local section. His remarks were followed by short speeches and expressions of interest by many of those present. It was clearly evident that the men present were really interested in the SOCIETY and in the support of a local section. A motion was carried unanimously that such a section be formed. The following men were nominated by Robert Twells and were elected to serve for one year:

A. B. Peck, Chairman
P. D. Helser, Vice-chairman
H. F. Royal, Secretary-Treasurer
F. H. Riddle, Councilor

Dues were set at one dollar a year.

Mr. Bleininger's address was followed by a brief discussion.

Two more meetings on the subject of "Refractories" are being planned. The list of members in the Detroit Section is given below:

E. B. Baker, Detroit-Star Grinding Wheel Co. Detroit, Michigan.
H. Bill, Champion Porcelain Co., Detroit, Michigan.
J. Betteley, Champion Porcelain Co., Detroit, Michigan.
K. Boyne, Ford Motor Car Co., Highland Park, Michigan.
W. A. Carter, Detroit Edison Co., Detroit, Michigan.
W. J. Cluff, F. B. Stevens, Inc. Detroit, Michigan.

J. Disney, F. B. Stevens, Inc., Detroit, Michigan.

R. C. H. Duclor, F. B. Stevens, Inc., Detroit, Michigan.

J. F. Gottron, Smith, Gottron, Berry Corp., Detroit, Michigan.

S. E. Hemsteger, Mt. Clemens Pottery Co., Mt. Clemens, Michigan.

P. D. Helser, A-C Spark Plug Co., Flint, Michigan.

O. W. Kraft, c/o Wolverine Porcelain & Enameling Co., Detroit, Michigan.

H. M. Kraner, A-C Spark Plug Co., Flint, Michigan.

G. S. Kennelley, Detroit, Michigan.

M. D. Lucas, Detroit, Michigan.

C. R. Moore, Champion Porcelain Co., Detroit, Michigan.

J. E. Purtell, Ashland Fire Brick Co., Ashland, Kentucky.

F. H. Riddle, Champion Porcelain Co., Detroit, Michigan.

J. W. Rollinson, Detroit, Michigan.

W. C. Steif, Mt. Clemens Pottery Co., Mt. Clemens, Michigan.

A. I. Snyder, Detroit City Gas Co., Detroit, Michigan.

R. A. Smart, Detroit, Michigan.

R. Twells, Champion Porcelain Co., Detroit, Michigan.

A. A. Treadway, Detroit, Michigan.

J. Watt, Ford Motor Car Co., Highland Park, Michigan.

L. E. Worthing, Detroit City Gas Co., Detroit, Michigan.

Taine McDougall, A-C Spark Plug Co., Flint, Michigan.

CALIFORNIA LOCAL SECTION TO ORGANIZE

The temporary organization of the new California Local Section of the AMERICAN CERAMIC SOCIETY was effected on October 15 at Los Angeles. Fifty men interested in the Ceramic industry were in attendance and all very eager to bring about this organization. In addition to this number about twenty men in the San Francisco district have expressed their desire to coöperate in this Section and undoubtedly will become members of the Section. The petition was signed by forty-four members. The temporary officers for the organization are:

President, A. Malinovszky
Vice President, G. R. Boggs
Secretary-Treasurer, T. S. Curtiss
Councilor, F. B. Ortman

MEETING OF THE COMMITTEE ON STANDARDS[1]

The Committee on Standards met on September 19, 1923 in New York City at Grand Central Palace. The following members of the Committee attended: R. F. Geller, Chairman, M. C. Booze, E. C. Hill, W. T. Stephani, R. M. Howe. R. C. Purdy was also present at this meeting.

The Committee was addressed by the chairman relative to the importance of the work on specifications and need for combined and unstinted efforts, on the part of every committee member, to expedite the establishment of specifications. The question of rearranging the committee into two groups, the first consisting of the chairman and four members of the SOCIETY who are actively interested in the technical phase of Ceramics to function as the Standards Committee proper, and the second group to be composed of the chairman, together with the several divisional Standards Committee chairmen, to

[1] By R. F. Geller, Chairman.

function as an advisory group, was discussed. The plan was favorably received, but the committee was advised that the present organization was written into the Constitution of the SOCIETY.

The subject of specifications was then taken up by the committee and the following business transacted:

A. It was passed that the Suggested Specifications for Whiting be revised to allow a maximum of 2% magnesium carbonate in class 1 whiting, and that the revised form be submitted to the General Secretary for vote with the recommendation that they be adopted as standard.

B. It was passed that the Proposed Tentative Specifications for the Purchase of Flint be resubmitted to the Divisional Committee by the General Secretary with the following suggestions and recommendations:

(1) That the manufacturer state the original form of silica from which the flint was obtained.

(2) That it be specified that the flint be shipped in paper lined cars.

(3) Regarding lime content that the specifications read, "not more than" the required per cent in order to provide for some variation.

(4) That the specifications be changed to include revisions suggested in the published discussion.

(5) That further consideration be given to the specifications for the determination of calcined color and fusing temperature.

(6) That provision be made for retest.

(7) That the specifications be submitted to the producers for consideration.

(8) That the specifications be put into a general or standard form, such as has been adopted for all AMERICAN CERAMIC SOCIETY specifications. It was further recommended that the placing of the specifications in their final form be deferred until the Bureau of Standards has completed its present investigation on the Effect of Various Types of Flint on Whiteware Bodies.

C. It was passed that the Tentative Specifications for Feldspar be resubmitted to the Divisional Committee with the following recommendations:

(1) That a special committee be appointed to devise a method for the determination of the relative viscosity of feldspar.

(2) That further consideration be given to the K_2O and Na_2O ratios as given in the specifications.

(3) That the specifications be so worded as to make clear the fact that a, b and c grades do not imply materials of decreasing quality.

(4) That the specifications be put into standard form.

D. Recommended Specifications for Limestone, Quicklime and Hydrated Lime.

It was passed that these specifications be submitted to the General Secretary for vote by the SOCIETY.

E. Tentative Specifications Published in 1921–22 Year Book.

(1) Regarding Proposed Method for Sampling of Clay Deposits it was passed that J. Spotts McDowell be appointed a special agent to devise a more satisfactory method of sampling.

(2) Tentative Method for Sampling Ceramic Materials as Delivered. Under item (3) it was passed that this be revised to read "the standard gross sample shall not be less than 0.1% of the total shipment." It was further passed that this Method in the revised form be submitted to the General Secretary for vote by the SOCIETY as standard.

(3) It was passed that Tentative Methods for Chemical Analysis, Slag Test and Transverse Strength be further considered by the committee.

(4) It was passed that the Method for Slaking be submitted to the General Secretary for vote by the SOCIETY as standard.

(5) It was passed by the committee that the Scale for Testing Sieves be submitted to the General Secretary for vote by the SOCIETY as standard.

(6) It was passed by the committee that the Tentative Definitions for Clay Refractories be submitted to the General Secretary for vote by the SOCIETY as standard.

(7) Tentative Methods of Testing Electrical Porcelain. It was passed by the committee that this be resubmitted to the Divisional Committee with the recommendation that F. H. Riddle be appointed special agent to reconsider them.

(8) Tentative Method of Test for Refractory Materials under Load at High Temperature It was passed by the committee that this be submitted to the General Secretary for vote by the SOCIETY as standard.

(9) The committee decided to give further consideration to methods and apparatus published in the Appendix.

Following this business the committee adjourned. The next meeting will be held at the time of the Annual Meeting of the SOCIETY in February, 1924, at Atlantic City.

NOTES AND NEWS

EDWARD ORTON, JR., NOW BRIGADIER-GENERAL

Military Record

Sergeant Major, 6th training Regiment, Citizens Training Camp, Plattsburgh, N. Y., August, 1916.

Commission to Major Quartermaster Corps, Officers Reserve Corps, July 5, 1917.

Called to active duty, Fort Sam Houston, Texas, May 9, 1917, assigned to Motor Transport Division, Quartermaster Corps.

Transferred to Washington, D. C., August 18, 1917, office of the Quartermaster General in charge of Engineering Section, Motor Transport Division.

Promoted Lieutenant-Colonel, in charge Service Division, Motor Transport Corps, September 6, 1918.

Awarded Distinguished Service Medal for service in standardization of motor trucks and equipment, May, 1919.

Discharged, June 2, 1919.

Commissioned Colonel, Quartermaster Corps, Officers Reserve Corps, September 12, 1919.

Commissioned Brigadier-General, Quartermaster Corps, Officers Reserve Corps, September 27, 1923.

Courtesy Harris & Ewing

BRIGADIER-GENERAL EDWARD ORTON, JR.

AUTOGRAPHIC EXPANSION APPARATUS

For Measurement of the Temperature Coefficient of Expansion of Any Material Available in Rod Form

General

The difficulty of accurately measuring the thermal expansion of metals, glass, porcelain and other solid material by previously existing methods has led to the development of a new piece of apparatus inherently accurate and extremely simple.

The measurement of the temperature coefficient of expansion by most existing methods shows a result applicable to only one temperature and does not give a complete picture of the expansion characteristics over a complete temperature range. The apparatus described below does give such a picture in a thoroughly comprehensive form.

Description

Figure 1 gives a general idea of the appearance of the instrument. It consists essentially of a camera mounted on a common base with an electrical heating unit and

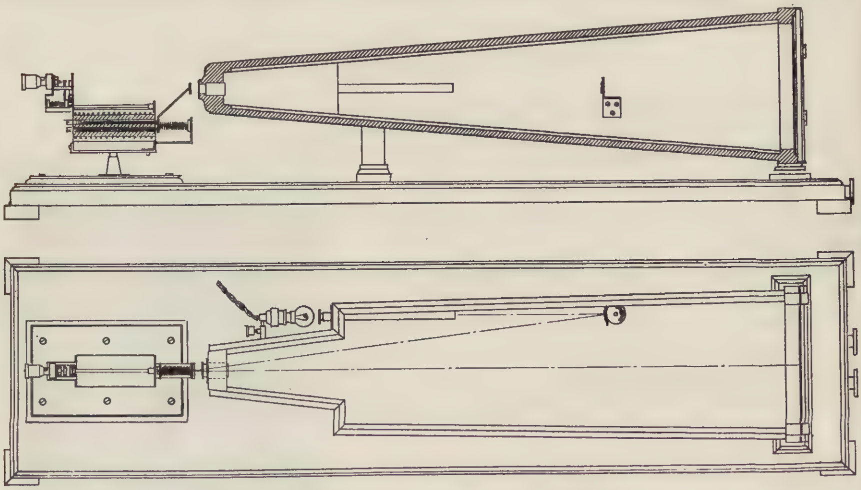


FIG. 1.—Sketch of expansion apparatus.

an adjustable source of illumination. The over-all length is approximately 48 inches, height 12 inches, width 13 inches. The electrical heating unit is wound on an iron core. It is provided with a thermostatic device and an auxiliary automatic switch so that at a temperature of about 200°C an auxiliary resistance is automatically cut out and at the temperature at which the test is to be discontinued the current to the heating unit is automatically cut off.

In the core of the heating unit are four holes running through it: one is to receive a thermocouple for accurate determination of temperatures; a second contains a quartz glass rod 10 cm. long which is the standard against which comparison of the sample is made. A third contains a standard metal rod with known expansion such as platinum or constantan. The fourth is to receive the sample rod which is to be tested.

One end of each rod is held against an adjustable screw at the back of the furnace; the other end is ground to a conical shape and is free to expand. The points of these

rods are held against a plate which is pressed against them by a coiled spring. To this plate is fixed a mirror by a suitable support. The expansion of the rods with respect to one another creates a movement of the plate pressed against them which in turn is conveyed to the mirror. The movement of the rod with known expansion, *i. e.*, either platinum or constantan, creates a movement so that a beam of light which is reflected by the mirror moves in a horizontal direction. The expansion of the rod which is being investigated creates a movement of the mirror which deflects the light in a vertical direction. The resulting graph is, therefore, a curve of which the horizontal ordinate corresponds to temperature and the vertical ordinate corresponds to expansion. The constants of the apparatus give a magnification of approximately 165 times.

The lamp which provides the beam of light has an adjustable screw and shutter, etc., so that the proper degree of illumination is readily obtained. The adjustment screws holding one end of the rods provide a means so that the test is started with the beam of light focused on the lower right hand corner of the ground glass objective plate. Sensitized photographic paper with millimeter cross-section lines is used exactly as a plate is used in a camera.

When the rods and light are adjusted, a plate holder is inserted in the back of the camera, the slide removed and the furnace started. The thermostat is then set at the temperature where the test is to be discontinued. The operator watches his pyrometer instrument and drops the shutter in front of the illuminating bulb at regular temperature intervals such as 100° or 200°. This shuts off the light for a brief interval causing a blank space about 1 mm. long on the photographic reproduction.

From the foregoing description it will be seen that the apparatus is almost completely automatic, entirely so except when accurate temperature measurements are required. The results are shown on cross-section paper in the form of a curve whose magnification is 165 times.

Formula and Tables

The formula for computing the expansion of a material in millimeters per meter is as follows:

$$Xt = \frac{10 \cdot Lt}{V} + Xqt$$

where

Xt = the expansion of a rod in millimeters per meter at the temperature t.

Lt = height of curve from horizontal base line at the temperature t. This is read directly from the plot made by the apparatus.

V = the magnification of the apparatus, *i. e.*, 165.

Xqt = the expansion of the quartz glass rod in millimeters per meter at the temperature t. (See table below.)

	Platinum	Pure iron	Constantan	Quartz glass
25– 100° Cels.	0.678	0.99	1.14	0.041
25– 200° Cels.	1.61	2.22	2.74	0.107
25– 300° Cels.	2.56	3.66	4.43	0.178
25– 400° Cels.	3.54	5.20	6.19	0.244
25– 500° Cels.	4.55	6.85	8.03	0.296
25– 600° Cels.	5.58	8.61	....	0.350
25– 700° Cels.	6.64	....	....	0.390
25– 800° Cels.	7.72	....	....	0.440
25– 900° Cels.	8.82	....	....	0.490
25–1000° Cels.	9.97	....	....	0.530

Charles Engelhard, Inc.
30 Church St.
New York City

NOTES FROM THE U. S. BUREAU OF STANDARDS

Trial Run of New Cupola Furnace

As mentioned a short time ago, the metallurgical division of the Bureau has recently installed a small cupola furnace for melting cast iron, which will be of great value in connection with its research work on ferrous metals. A trial "run" of this equipment was made during the past month. It was found possible to melt the cast iron ready for pouring within four hours after starting the fire. Three hundred pounds of iron have been melted and poured into test bars and pigs. The character of the iron has not yet been determined, but so far as the operation and behavior of the furnace are concerned, the trial run was a pronounced success.

Cast Iron for Enameling Purposes

In connection with the Bureau's investigation of the enameling of cast iron, several typical castings have been received and have been coated with representative enamels. This work is still in progress, and all the castings will be examined for blistering. Microphotographs will be made of the surfaces in order to detect any changes produced by the enameling operation. It is hoped that the cause of blistering of these castings will be discovered, and means developed to control and if possible eliminate it.

Effect of Sea Water on Glass

Some work was carried out during the past month on the effect of sea water on various types of glass, to determine the best kind to use for the lenses of signal lights on shipboard. From the data which the Bureau has secured, the damage which these lenses often suffer appears to be caused by the evaporation of sea spray, which leaves a deposit of salt on the surface of the lens. This eventually etches the glass. Three types of glass, boro-silicate, lead glass, and ordinary soda-lime glass, have thus far been investigated. Under the conditions of the test, lead glass etched considerably, while the other two did not.

New Micrometer for Accurate Measurements

A micrometer of extraordinary accuracy has been constructed by the Bureau of Standards for determining the diameter of some 12-inch porcelain cylinders to be used in electrical measurements. Measurements made with the new instrument are independent of the observer and have an accuracy of 0.0001 of an inch. In order to obtain this degree of accuracy, it is necessary to operate the micrometer from a distance and to take readings from it through a telescope so that the heat of the observer's body will not warp the thick iron ring enough to cause an error. Both the instrument and the cylinder which it is employed to measure must be kept in a constant-temperature box during the measurement. The micrometer consists of a cast iron ring large enough to pass easily over the 12-inch cylinders. On opposite sides are the micrometer screw and the contact pin, while at right angles to these are adjustable lugs for centering the device on the cylinder. The micrometer screw is driven by a tiny electric motor and the ring with its attachment, including the motor, is suspended by three light rods and can move freely for a short distance.

In making a measurement the micrometer screw is revolved by the motor through a train of gears, the motion of the screw pushes the cylinder against the contact pin and when this contact is made, the motor circuit is broken thus stopping the screw. The cylinders which are to be measured will be wound with wire on a precision lathe and will form inductance coils of very accurate construction, the inductance of which can be calculated from the dimensions. They will be used for research work in a program

for standardizing all of the electrical units in terms of the fundamental standards of length, mass, and time.

Study of Architectural Properties of Terra Cotta

During the past month 110 balusters and 68 coping blocks, fired in commercial kilns, were forwarded to the Bureau for test and have been set in mortar and exposed for weathering. A duplicate set is being saturated with paraffine and will also be subjected to the weathering tests. Absorption is being determined on balusters, and tests for this property, as well as for transverse strength, have been made on specially prepared bars representing five bodies used in the manufacture of terra cotta. The data thus secured will be correlated with the heat treatment which the respective pieces receive in firing.

Investigation of Potters' Flint Including the Effect of Kryptocrystalline Flint in Pottery Bodies

Eight sanitary ware bodies made with flint under investigation by the Bureau have been fired and tested for transverse strength, porosity, and resistance to quenching. The porosity and strength of the bars varied considerably, indicating the need of a longer soaking period in finishing these burns, and for this reason the work will be repeated.

The strengths of the fired bodies did not show a regular variation according to type of flint used, such as was found in the case of vitreous china. The work, therefore, needs to be checked, and additional samples of flint have been requested from the producers.

In connection with the porosity determination, various methods and periods of soaking have been tried in order to show their relation to the method used in this investigation. A few experiments on drying the saturated pieces have also been carried out. Quenching tests made from 200°C to water at 30°C confirm previous indications that bodies made with the kryptocrystalline type of flint are more resistant to failure than those made with sand or rock quartz.

Standard Specifications for Whiteware Pottery

A committee of the Vitrified Chinaware Manufacturers met with the Committee on Chinaware and Glassware of the Federal Specifications Board on July 10 and three sets of chinaware were agreed upon, *viz:* (1) $^1/_2$ thick vitrified chinaware for enlisted men's dining service as used by the Army, Navy and Marine Corps; (2) vitrified hotel chinaware for all government dining service and hospital service, where desired; (3) $^1/_4$ thick vitrified chinaware for hospital service. Drawings of the different articles are now being made so that each purchasing department and manufacturer can be supplied with a set of blueprints.

Physical Properties of Clay Bodies as Affected by Drying Treatment

Tests have been made upon the physical properties of various clays and body compositions to determine the effect of drying treatment. Some of this work is being carried out in coöperation with the investigation of the effect of various potters' flint in semi-porcelain bodies. In this way drying effects are being traced from the plastic to the burned state, and the effect upon the drying behavior of variation in the body composition is noted.

Observations are being made to determine the effect of gravity upon the uniformity of drying and shrinkage in large commercial pieces. It is expected that it will be possible to establish a set of standard laboratory drying tests, similar to the firing tests now used,

and from these the ideal drying treatment and resulting effects may be reported for any clay or body which may be submitted to the Bureau for examination.

Plasticities of Clay

Work is in progress on the development of a penetration type of plastometer to be substituted for the capillary tube plastometer. The latter form is not applicable to very stiff paste or bodies, such as those used by potters in the molding of forms, but is used in the study of clay slips employed in the casting process, but not the study of the molding range.

With the capillary tube plastometer, the shearing stress is varied by changing the total pressure acting on the material, while in the penetration type, the shearing stress is varied by changing the pressure of the penetration rod.

Dictionary of Specifications

Work has been started at the Bureau of Standards on the compilation of material for a dictionary or handbook of specifications for supplies purchased by Federal, State and Municipal governments and public institutions. This work grew out of a meeting held in May, 1923, of State Purchasing Agents from all over the country, and at which the coöperation of the various states was assured in this matter.

On July 11, a conference was held of various national organizations interested in the preparation and unification of purchase specifications and in their use from the point of view of both the producer and the consumer. This conference was called for the purpose of organizing an advisory committee to coöperate with the Department of Commerce and the National Conference of State Purchasing Agents in the work of formulating purchase standards, specifications, and tests. Although no meeting of this advisory committee has yet been held, the various organizations represented are coöperating actively in the actual work of compiling the material for the dictionary, and a great deal of information has been supplied.

Correspondence conducted with the officers of trade associations and the purchasing agents of a large number of municipalities and public institutions has established the fact that all the individuals and groups for which the dictionary of specifications is being prepared will welcome its appearance enthusiastically and coöperate actively in the preparation.

A collection is now being made of all available specifications prepared by the various departments and independent establishments of the Federal government and those used by State and Municipal governments, public institutions, and the important national trade associations, and technical societies. These specifications are being thoroughly card-indexed and classified. Care is being taken to pick out those specifications which are most urgently needed, and due consideration is being given to the attitude of purchasers and consumers toward the existing and the proposed specifications.

GOVERNMENT EXPERTS PRODUCE LARGEST LENSES EVER MADE FROM AMERICAN OPTICAL GLASS[1]

Department of Commerce Describes Accomplishment as "Marked Advance" in American Industry

The largest lenses so far made from American optical glass have just been completed at the U. S. Bureau of Standards, it was announced today at the Department of Commerce.

[1] Department of Commerce, Washington, D. C.

The difficulties of securing a good enough piece of glass increases greatly as the size increases, the government experts say, and the production of 12-inch lenses having a combined focal length of 12 feet 8 inches represents a marked advance over what was possible in America a few years ago. It is considered only a question of time, however, before much larger lenses can be made at the Bureau of Standards, according to experts.

In discussing the significance of the accomplishment, Dr. G. K. Burgess, Director of the Bureau of Standards, stated that until the beginning of the war in 1914 the art of making optical glass was unknown in this country, all glass used here being imported from Europe. When the European supply was cut off the Bureau of Standards began research looking towards the development of the industry in America. By the end of the war the plant built at the Bureau of Standards in Washington was able to turn out large quantities of excellent glass and several of the large optical manufacturers had built plants of their own. But no lenses much over five inches could then be made here, for the production of large lenses is a branch by itself requiring special care.

Optical glass is made in pots holding a thousand pounds each, and if the pot is cooled to room temperature within a few days the glass will break into many small pieces. These cannot be welded together, so the lens cannot be larger than the largest piece. If several weeks are taken for the cooling of the pot the glass may come out in one big piece, but great care is required in the making in order that this large piece may be sufficiently free from defects to be used as a single lens. Difficulties are encountered in the annealing of such pieces.

Final Polishing May Take Weeks

The lens is molded to nearly the proper form and is ground to the correct shape as exactly as is possible with the best of measuring instruments. But the final finishing must be done by hand and all errors of as much as a millionth of an inch corrected. The surface is carefully polished with rouge, a little here and a little there, until tests show it to be correct.

The test used for showing errors in the lens consists, in effect, of forming an artificial star with the lens and then viewing it through the lens. A tiny pinhole in the metal chimney of an oil lamp is placed at the focus of the lens, and a mirror behind the lens reflects the light from this artificial star back through the lens again to an eyepiece placed beside the lamp. The light thus passes through the lens twice and the effect of defects is thereby exaggerated. A patient study of the lens then permits them to be located and corrected. As there were four surfaces to this pair of lenses the magnitude of the task can well be imagined. The work was done by Mr. John Clacey of the Bureau staff, and occupied a large part of his time from the first of April to the middle of July.

These lenses form what is known as an achromatic combination. One is of crown glass, the other of flint glass, and the combination is so designed as to bring light of all colors to a focus at the same point, whereas with a single lens the focus is different for different colors. It will be used by the Bureau of Standards for various kinds of research in optics and possibly for making astronomical observations. It will be especially valuable in optical problems which require the use of a beam of parallel light.

CALENDAR OF CONVENTIONS[1]

Organization	Date	Place
AMERICAN CERAMIC SOCIETY (Annual Meeting)	Feb. 4–8, 1924	Atlantic City
American Concrete Institute	Feb. 25–28, 1924	Chicago
American Face Brick Assn.	Dec. 4–6, 1923	French Lick, Springs Ind.
American Face Brick Assn. (Southern Group)	Nov., 1923	West Baden, Ind.
American Institute of Electrical Engineers	Feb. 4–7, 1924	Philadelphia
American Malleable Castings Assn.	Jan., 1924	Cleveland, Ohio (?)
American Road Builders' Assn.	Jan. 14–18, 1924	Chicago
American Zinc Institute	May, 1924	St. Louis, Mo.
Assn. of Scientific Apparatus Makers of U. S. A.	April 18, 1924	Washington, D. C.
Common Brick Mfrs. Assn. of America	Feb. 11, 1924	Los Angeles, Calif.
Gas Products Assn.	Jan., 1924	Chicago
Hollow Bldg. Tile Assn.	Jan., 1924	Chicago (?)
Institute of Metals, Div. of American Institute of Mining and Metallurgical Engineers	Feb., 1924	New York City
Natl. Assn. Brass Mfrs.	Dec., 1923	New York City
Natl. Assn. of Stove Mfrs.	May 7–8, 1924	New York, Hotel Astor
Natl. Bottle Mfrs. Assn.	April 27, 1924	Atlantic City
Natl. Brick Mfrs. Assn.	Jan. 28–Feb. 2, 1924	Cincinnati, Ohio
Natl. Builders Supply Assn, Inc.	Feb., 1924	Chicago (?)
Natl. Electric Light Assn.	May or June, 1924	
Natl. Glass Distributors Assn.	Dec. 4–5, 1923	Pittsburgh, Pa.
Natl. Paving Brick Mfrs. Assn.	Dec., 1923	
Penna. Gas Assn.	April, 1924	Atlantic City
Portland Cement Assn.	Nov. 19–21, 1923	New York City
Society of Promotion Engineering Education	July, 1924	Boulder, Colo.
Stoker Mfrs. Assn.	April or May, 1924	(?)
U. S. Potters Assn.	Dec., 1923	Washington, D. C.
Western Society of Engineers	June 4, 1924	Chicago

[1] Further information may be secured through the Chamber of Commerce of U. S., Washington, and World's Convention Dates, New York, N. Y

BULLETIN
of the
American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Vol. 2 | **December, 1923** | **No. 12**

EDITORIAL

SCIENTIFIC RESEARCH ENTERS NEW ERA

On page 150, *Bulletin* section of the June issue of this *Journal*, appeared these paragraphs.

> Scientific research, affording new channels for the aspirations of the engineer, is entering upon a new era both here and abroad. Following the $500,000 gift of Ambrose Swasey of Cleveland, making possible the organization of Enginering Foundation, comes news from London that Sir Alfred Yarrow has given the same amount to the Royal Society for the same purpose.
>
> The philanthropy of Sir Alfred, who is an honorary member of the American Society of Mechanical Engineers, is characterized as another step toward the identity of effort which engineers and men of science are striving to accomplish throughout the Anglo-Saxon world. "I should like to record my firm conviction that a patriotic citizen cannot give money, or leave it at his death, to better advantage than towards the development of science, upon which the industrial success of the country so largely depends," said Sir Alfred in his deed of gift.

Since then other large endowments have been made for industrial research. The American Chemical Society has an annuity of $25,000 to be given as prize for the most valuable contribution to the knowledge of chemistry or chemical processes. The National Research Council has a

long list of endowments and research funds. The number of manufacturing concerns having a well equipped laboratory and well trained research force is increasing. All the technical associations and societies have rapidly growing rosters and are engaged to a continually increasing extent in the promotion of scientific education and industrial research. The record of membership increase in the AMERICAN CERAMIC SOCIETY, as here shown, typifies an increasing realization on part of the ceramic industrialists of the value of technical application of scientific research which is paralleled in nearly all industrial lines.

	1922 12 months			1923 11 months		
	Personal	Corporation	Total	Personal	Corporation	Total
New Members Secured	359	84	443	392	73	465
Losses	98	7	105	73	5	78
Net Increase	261	77	338	319	68	387
Roster Total	1611	216	1827	1930	284	2214

It is not due altogether to the effort of the membership committee nor altogether to the substantial value there is in the accomplishments of the SOCIETY that during the past eleven months the SOCIETY has added a larger number to its roster and at the same time had a smaller number of withdrawals than during the previous twelve months. To no small degree these data reflect an increasing appreciation by ceramic executives and plant operators of the necessity of keeping in touch and abreast with the rapidly accumulating amount of fundamental facts and principles and of their industrial application.

The ceramic industries find it profitable to support collegiate schools and the federal and state research departments. They find profit in the trade press and the technical literature. But there is no means whereby the information from and through these several sources can be applied except by the plant operators. The plant operators must obtain, understand and apply the information.

The program of service on which the AMERICAN CERAMIC SOCIETY is engaged is to stimulate research, to analyze facts and methods, standardize materials and products, publish results of original investigations, abstract the world's literature, publish bibliographies, and by every other practical means to make available to the operators of ceramic factories all the information most pertinent to manufacturing the highest quality of wares most economically. This is an extension educational work that is imperative to solid welfare of the ceramic industries.

It is in support of this sort of service that large donations and endowments are being made, for which large organizations are supported and for which many concerns maintain extensive laboratories. It is because of the value in such services that nearly all trade associations in all industrial lines are supporting technical research.

It has been proven that when the manufacturing concerns generally, large and small, are coöperating in working out their common fundamental problems that larger benefits accrue and these more promptly.

The work being done through the channels provided by the AMERICAN CERAMIC SOCIETY will be more effective and the returns larger in proportion to the number of plant executives and operators on its roster. This being a mutual SOCIETY in which all have equal responsibilities and benefits there is every reason for enlisting the largest possible number of ceramic workers. It increases the number of contacts through which information is obtained and applied. For this reason the membership committee is vigorously working to increase the number of co-laborers. And because the services rendered through the SOCIETY results in more economical plant practices and better quality of wares the corporations are being asked to help make possible the rendering of this service to and through their plant operators at the smallest possible cost to the operators. This opportunity must be kept within the financial means of the young men in the plants.

PAPERS AND DISCUSSIONS

OBSERVATIONS ON THE EUROPEAN GLASS INDUSTRY[1]

By Henry W. Hess

The conditions of the European glass industry are undergoing rapid changes, in keeping with all other events of these countries. During the last few years, especially last year, the production of German glassware was made on a very cheap basis, and practically stopped English manufacture. In several cases, the jobbers of glassware were themselves stockholders in English companies, and they found it more profitable to discontinue manufacture, and to handle German goods. Of late, this condition has changed somewhat, as German costs are rising, and it has given the English manufacturer a chance to develop his own business. As a result, there is more activity in English glass circles.

In America, the labor problem, and other economic conditions, together with our national custom of large mechanical installations, have developed the production of much machine-made goods. In European countries where labor has been cheap, and at the present time capital for investment is scarce, there has been until recently a slow-down of machine development in the glass industry. Even with this condition existing, the invasion of Europe with American glass machines has started and its march is certain.

The Libbey-Owens Sheet Glass Company has established a plant at Moll near Antwerp, in Belgium, with offices at Brussels. The Company is known as the Compagnie-Internationale pour la Fabrication Mecanique des Vers. This is a most modern plant with by-product coke ovens owned by the same company supplying fuel. The plant will consist of three furnaces and six machines. This glass will be used all over Europe, as Belgium exports, even now, over 90% of its glass products.

In this connection, showing the trend of the times, it is interesting to note that the hand producing window glass companies are financially interested in the mechanical plants. In Spain the new window glass plant near Barcelona, operating two machines, will be of the Libbey-Owens type. In Switzerland, the same type of machine plant, using one machine, is being built.

The O'Neill machine, also built and developed at Toledo, Ohio, with branch plant at London, has over one hundred machines in Europe. These machines have been found very adaptable to European conditions, and with the feeder installation, have met with great favor.

Several other types of bottle machines of American manufacture are also found in England, and on the Continent.

The Owens bottle machine has made its way into England, and also on the Continent, and future developments of this machine are to be expected.

[1] Read before the Glass Division, Pittsburgh Meeting, February, 1923.

The Westlake bulb machine, made by the Libbey Glass Company of Toledo, is now operating in England, and more machines are to be installed. The introduction of this machine on the Continent is certain. Arrangements have been perfected for its installation in Germany, and other installations throughout Europe are planned in the immediate future.

The Danner tube machine, one of the most successful glass machines of recent years is in successful operation in England, and like the Westlake bulb machine, its introduction into Continental Europe is assured.

In addition to the above mentioned, there are other automatic and semi-automatic machines of American make that are finding favor in Europe.

The introduction of these machines into Europe will develop a new line of thought and endeavor in these countries.

In hand manufacture, the personal element helps to overcome many of the varying glass house conditions. Glass of varying temperatures can be controlled by the manipulations of the operator. Bad glass can be skimmed off, imperfections can be cut out by the individual workman, etc. In an automatically operated machine plant, the connecting furnace must have a constant supply of gas, uniform in composition and pressure. The variations in temperature of glass at different stations must be kept within very definite and unvarying limits, and all glass flow must be kept constant, and local deterioration of glass must be carefully avoided. The machine does not discriminate and uses glass as it comes.

These conditions have been fought out in this country and are still being fought. They are now being encountered in the new European installations, and glass house engineers and managers in those countries will do well to recognize the necessary changes. Those who observe them will get production, and those who do not, will blame the new machines.

To illustrate this point, I recall an experience I had with a feeder on a certain machine in Pennsylvania. The bottles produced were poor, and full of white specks, and while occasional runs were made successfully for short periods, the operations were very unsatisfactory. At the same time, the same installation at a nearby city was working very nicely. Examination showed that the operation of the furnace, and floating impurities in the glass caused all the trouble, and not the operation of the machine or feeder. As soon as the tank conditions were improved, the first plant operated as well as the other.

A great many of the troubles and production losses of all types of automatic glass machines may be traced to faulty glass conditions, faulty glass, and in some cases, glass of improper composition for efficient machine use. All of these conditions require a revision of the old type of glass house practice, and the best possible checks on the composition, the relation of temperature to composition, physical properties of the glass, design of the furnace, and many other factors must be considered.

A great many Americans travel abroad in company with their fellow citizens, and make observations and criticisms from our own view point entirely, without considering matters from the economic conditions existing in the countries being visited. In European countries, labor is plentiful, and we notice great labor wastes, with great conservation of building and raw materials, which are not so plentiful. In our own country, this condition is reversed, and the European traveler notices our economy of labor and the introduction of machines, with corresponding wastes in the materials he conserves.

In English glass plants, certain types of workers seem to be skilful, and rank perhaps better than the average American, but in other branches, such as bulb and tube plants, the workers apparently have been developed during war times, and have never acquired the skill of our American workmen.

The fuel problems of England are much the same as our own, and seem to be handled much the same way, and they are using similar grades of fuel. On the Continent, and especially in Germany, very poor fuel is used, and great care is exercised in their fuel installations. In Germany, I understand, they are now using much lignite as fuel in their producers.

Some of the old English plants are extremely interesting, the original plants, built many years ago, are still operated on the same grounds with modern installations, and it is possible to allow one's fancy to dwell on the romance of the glass industry.

The past war has been a great factor in bringing about changes, and before long, the characteristics of individual countries in this industry will gradually disappear. Abroad, they are adopting many of our ideas, and we, in turn, are manufacturing articles formerly made only in Europe, and before long, only slight differences of practice, as necessitated by local conditions, will be apparent.

Toledo, Ohio

THE IMPORTANCE OF FIGURING TAXES INTO COSTS[1]

By F. T. Owens

Introduction

"Why should we figure taxes into costs?" "We propose to pay our taxes out of our profits for this is what we have always done in the past, why should we change in the future?" One answer to this question is, If you are not going to consider taxes as an expense item in your business, how are you going to arrive at a proper selling price? This is the Yankee's plan of answering a question by asking another.

[1] Read before the Heavy Clay Products Division, Pittsburgh Meeting, February, 1923.

It might be interesting to note that today the interest alone on our public debt is upwards of $950,000,000, or approximately $250,000,000 more is paid now for interest than the entire cost of running this Government in 1906 and 1907. Someone must pay the taxes to enable the Government not only to pay its running expenses, but this tremendous item of interest as well. To those of you who have been following this question, a repetition of some figures will not be interesting, but there may be others who have not come in contact with these and I should like to bring out the point in a very splendid talk of James W. Good at the meeting in West Baden in December, in which he stated that the estimated cost for soldier relief alone for next year is $1,715,000,000. He stated further that if the future can be judged by the past that this sum must grow each year for a considerable number of years, for the tendency is to keep in mind the service rendered by our brave and noble soldiers and reward them accordingly as time goes on.

These taxes must be met, and they are collected from manufacturing industries.

Why should we figure them in our costs? I wish to call to your attention the thought that costs are figured for two reasons—the principle one being to make a selling price which will show a return on the capital invested in the business. In making this selling price, we must not only figure our direct costs, which cover items of material, labor, rental, insurance and similar expenses, but we must go a step farther and estimate as nearly as is possible what our taxes for the year are going to be.

If we could tell you today how you could make savings in your plant approximating $2000 to $10,000 per year, you would very likely be making notes that would enable you to put the plans described into effect. Why then should you overlook the thought of sitting down and figuring carefully just where you are going to arrive at the end of the year, provided you have a normal year's business, and in making this calculation figure at the same time the probable amount you will have to pay to your Government. When all this is done, you will be enabled to arrive at a cost basis which will fix a selling price adequate to pay a return on the capital, energy and time spent in the business.

Taxes are going to increase, not decrease. This means that in some lines of business more improved methods must be introduced in order to reduce the burden of cost and, while this burden of direct costs will be reduced, the manufacturer must hand over more and more of his earnings to the Government to help maintain it. In certain kinds of products, there is a limit to the cost that the public will pay and when it reaches a price which the purchasing public thinks too high, substitutes will be used and the business will gradually sink to oblivion.

Obsolescence

I also wish to direct your attention to the important matters of obsolescence and depreciation. There are none but will grant readily that the last five years have seen some wonderful strides made in the heavy clay products manufacture, and the next five years will see even greater changes in methods. I feel sure that the plant that is today up to date in every particular will be practically obsolete ten years hence. If not obsolete by reason of anything else than the cost of producing its material, for labor saving devices will be installed and installed so efficiently that the manufacturer who is not willing to add these to his plant will find himself with a cost so high he cannot demand a fair share of the business.

Depreciation

Sufficient depreciation should be figured on every unit of production to cover replacement when replacement must be made. A number of face brick plants have found that where the average production is 40,000 brick per day, the depreciation cost will run about 55 cents per M brick.

Do not make the fatal mistake of figuring depreciation on production alone, for your kilns will depreciate more rapidly by standing idle through a severe winter than they will if used daily. In figuring depreciation, take the average yearly production and reduce it to a monthly depreciation which will be charged whether the plant is operating or not.

A stabilized market is after all the best market in which to sell goods and if all manufacturers would approach their question of costs in exactly the same manner, then we would find fewer instances of men offering materials at prices way below that which their competitors can manufacture. These differences are not due in many cases to manufacturing methods—they are most often due to inaccurate cost methods.

If one manufacturer is setting out to reap a return of 15% net after all taxes are paid, how can he expect to compete with the man who figures that a 10% gross return is sufficient? How can any ordinary sized business today live on a 10% gross return when the turnover is hardly once in the year's business?

The department store turns over its investment four to six times a year on a 20 to 30% margin. The heavy clay products manufacturers do well if they turn over their investment one and one-half times a year. We are, therefore, entitled, justly so, to a larger return on this turnover than the business which can turn over its investment four to six times per year.

Fiske and Co., Inc.
Watsontown, Pa.

CLASSIFICATION AND SPECIFICATION OF FELDSPAR FOR USE IN VARIOUS INDUSTRIES

By James Turner

Introduction

The following remarks apply only to what I think would be desirable and serviceable for semi-porcelain, vitrified china, white electrical porcelain, white sanitary ware and white vitreous tile, of which I am somewhat familiar. In the other lines of ceramic manufacture I have no experience.

Chemical Composition.—Feldspar with an alkali content of 10% upward can safely be used in a body mix. This would therefore be the range of most feldspar or graphitic granite that is mined, ground, and sold commercially at this time.

The predominant alkali is potash in the ratio of about six to one of soda. However, I know of one good feldspar that has a ratio of about nine of potash to four of soda.

Exception may possibly be taken to the low alkali content given above so in justification will state that Cornwall stone with an alkali content of 6 to 7% has been exclusively used in another country for some generations in the manufacture of the various ceramic bodies that I have before enumerated.

The higher or lower alkali content is replaced by a lower or higher silica content, the alumina showing very little variation. This has been my observation of the analyses of many samples of feldspar.

The analysis should give no more than a trace of iron or other darkening minerals and when fused should be free from specks to any one with good eyesight. To expect an absence of specks when observed through a magnifying glass would place feldspar almost in the class of precious stones and therefore outside the purchasing power of the ceramic manufacturer. Also the production of feldspar to pass such a test would shrink to such small volume that it would have to be given up by the ceramic industry.

Color on Fusion.—Observation has shown that the same ground feldspar fired at different time-temperatures varies a little in shades of whiteness. A high silica and low alkali feldspar will change from a faint lilac tint at cone 7 to a clear white at cone 11. A high alkali and low silica content feldspar will change from the lilac tint at cone 7 to an almost transparent glass at cone 11.

As the range of fire of the various productions is from cone 8 to cone 12 and each manufacturer uses his own kilns to test out the feldspar he purchases, it seems to me that it would be impossible to fix one time-temperature as a standard to be used by all manufacturers.

Fusion Test.—In order to set a standard fusion test it would seem that the temperature, time and "soak" would of necessity have to be first standardized and this is a rather difficult undertaking.

To illustrate, in a small muffle of about ten by eight by six inches, a heat of about cone 11 half over may be developed in about four and one-half hours, giving a certain fusion on a standard sample of ground feldspar. The same result with the same feldspar will be obtained by firing in a round 16-ft. biscuit kiln in about 55 hours with cone 9 bent over. The reason for this is obvious. In addition to this with cone 11 half over in four and a half hours the same muffle kiln in successive firings the same feldspar may not be equally fused for sometimes the body of heat will hang longer in the muffle (after the fuel has been cut off) and therefore, in the vernacular of our business, "soak" whatever is in the muffle. In other words, the maximum heat will stay in the kiln longer one time than another.

This "soak" does not bring the cone down any lower but it will have the same effect on the material as though the heat had been raised an additional cone. This variation takes place in both small muffles and large kilns, so it seems that some additional check would of necessity have to be used to compare by burning the various shipments of feldspar for uniformity of color and fusion.

This can be done and is done by keeping a large standard sample of the feldspar that is being used and is of satisfactory color, fusion, cleanliness and fineness of grind. A small quantity of the standard sample should be put in the kiln with a sample of each new shipment. This comparison when fired even at a slightly higher or lower temperature, should be definite enough to determine whether the quality is reasonably uniform with the standard sample. Of course this is a very simple way, but I have not yet heard of any better method of testing for continuity of uniformity.

There are many manufacturers who prefer a feldspar that has a low alkali content their reason being that at the closing period of the fire (biscuit) they can give a longer soak and obtain the result they desire without so much risk of deformation.

Fineness of Grinding.—As to an arbitrary standard the same difficulty arises as in the standard for alkali content. The various manufacturers have different proportions of the component materials that make up their body. The ground materials (flint and feldspar) cover a range of from 50% to 60% of the bodies. Feldspar runs from 12% to 30% so the range of this material is very great. In vitrified china, there is a small proportion of the highly plastic ball clay used, owing to its detrimental effect on the color as shown in the translucency. Every means is used to obtain plasticity, one of which is the use of a china clay that combines as much as possible, color, plasticity and the strongest tensility, and another means is to use very finely ground flint and feldspar.

Comparatively large quantities of ball clay are used in semi-porcelain and white sanitary ware to obtain sufficient plasticity and strength for

the forming of the pieces of ware. This is especially necessary in sanitary ware owing to the size of the pieces and the strength required for handling in the green state. These large proportions of ball clay aid in vitrification, modifying the feldspar content and a somewhat coarser grind of feldspar would not be detrimental.

As white sanitary biscuit ware is fired at temperatures ranging from cone 8 to cone 11, the content of feldspar varies very considerably in their body composition. Some who fire at cone 8 like a feldspar of high alkali content hence low fusion point, while others use a "harder" feldspar to avoid blistering and to obtain a somewhat wider range of heat at the finish of the firing without detriment to the ware. Whether they use a "hard" or "soft" feldspar they have perforce by experience determined upon a suitable proportion of body materials and a certain temperature-time treatment in the firing of their kilns. These are standard. Whatever kind of feldspar has been found satisfactory, they would naturally desire to receive in continuous uniformity both as to quality and grinding.

The writer has found through a rather long experience in the manufacture of whiteware and in the grinding of feldspar, and a close touch with the desires and requirements of a number of excellent potters (whose excellency is attested by their productions) that a rejection of not more than one per cent on a 160's P. B. Standard lawn is satisfactory to all whiteware manufacturers. I know of one instance where a little more exacting standard is required and this calls for the equivalent of not more than three-quarters of one per cent rejection on a 160's P. B. lawn. On the other hand, manufacturers would be well satisfied if not more than $1^1/_2\%$ is shown on 160's P. B. lawn.

It is very difficult for a grinder who is producing in bulk a product of definite commercial uniformity with the mill and conveying apparatus arranged for the most economical movement of the product, to have various grades of fineness. These could be obtained with very little difficulty from the mills but the segregation in storage would be irksome and take up a great deal of space even if there were only three meshes of fineness.

When a grind of less than 1% on a 180's P. B. lawn has been offered chiefly as a glaze feldspar there has been very little demand for it. The same feldspar at 180's would have a little lower fusing point than at 160's, but when it is put into a glaze composition the whole goes into a cylinder or pan and is ground together for a period of from 20 to 30 hours according to the quantity of the batch, and the hardness of the frit, so that it gets some additional grinding.

A finer grinding might be more desirable where a raw electrical porcelain glaze is being compounded and mixed as this glaze is not so much ground as amalgamated.

Feldspar for Glazes.—For glaze purposes, some manufacturers

desire and insist on a very high potash feldspar with as little soda as possible and are of the opinion that a good glaze cannot be made without it. Others use a combination of two feldspars in the glaze and the finished product is beautiful and the reputation of the ware is excellent. Another potter uses the hardest of feldspars in his glaze obtaining his luster and fusion by increased use of other fluxes. Some potters desire for their glaze a feldspar with a very low fusion point and they get it, but it undoubtedly contains a considerable proportion of soda, though their glazes are good and their ware commercially satisfactory.

Summary

Summarizing, I do not think that a definite specification should be made for the alkali percentage in feldspar. If one were made I think that the great majority of users would ignore it as they would always adopt that which they thought would be best suited to the economy of their manufacture and the quality of their product.

However, I think that a ratio of six of potash to one of soda makes a desirable proportion and can be used in all manufactures.

The feldspar when fused should be free from specks visible to good eyesight.

The fused feldspar should be white drifting toward the warmer cream suffusion rather than a cold bluish white.

When fused its luster should reflect light.

Whatever the alkali content or tone of white it should be reasonably uniform in every shipment and the comparison can be made most surely by a firing test against a satisfactory standard sample. To my mind it is the continuous uniformity of the product that is of most value to the users, and not so much the alkali content.

The standard of grinding which I think would be very satisfactory to manufacturers is not more than 1% rejection on a 160's P. B. Standard lawn. I know so many able manufacturers of semi-porcelain, vitrified china, white electrical porcelain, white sanitary ware and white vitreous tiles who have found this standard suitable for their purposes.

Cook China Company
Trenton, N. J.

DISCUSSION ON "SANDBLAST CASTINGS TO BE ENAMELED"[1]

J. Grainer:—Has anyone had any experience with steel shot?

J. F. Ritter:—We commenced using steel grit in our plant in February, 1923, and we have practically eliminated the dust in our sandblast department.

[1] F. G. Jaeger, *Jour. Amer. Ceram. Soc.*, **6** [9], 976 (1923).

J. E. HANSEN:—I have been using crushed steel sold by the Pittsburgh Crushed Steel Company for the past two years. I could not use the sand because of the dust raised but have obtained good results with steel.

H. F. STALEY:—One of the companies for which I did considerable work has had some experience with crushed steel and shot. For quite a while they used a mixture of two-thirds crushed steel and one-third 30-mesh shot. Some time back they ran into considerable difficulty in that they found a deposit of graphite left on the castings after they had been sandblasted. Since then they have been using about 35% sand in the mixture with good results. Without the sand they do not get the castings bright and shiny as they want them.

M. E. MANSON:—What is the approximate cost of the sandblast?

F. G. JAEGER:—It requires about 50 h. p. to drive it. It also requires about 10 h. p. for the fan, making 60 h. p. in all. The cost would be about $2500.

We used some steel shot in connection with the sand but we found that if we did not use more force, the sand did not take effect on the ware.

J. GRAINER:—This is of vital importance to any one doing cast iron work. We are having considerable trouble with our wet white. Wet white has not reached that degree of perfection where it will overcome the slightest imperfection. The ware must be scrupulously clean. Would the steel shot polish the ware and get down into the iron? When one piece of ware is left in the blast for a minute, it is apparently clean. It is not clean, however, and the results are unsatisfactory. In justice to different firms that are using wet whites there may be some wet white that gives satisfaction, but the work must be cleaner than in the dry white.

A MEMBER:—In Wisconsin steel shot was used for three years or more. We found that it tears the material more than the sand. Sand apparently is safer and cheaper.

A Workman's Compensation Law in Wisconsin is more drastic than in most other states, which involves another question. There is always more dust in the sandblast room than is considered healthful. If a man stands in a draft and catches a cold, you pay him for his time off. Apparently the day is not far distant when they will absolutely prohibit the use of a room of that character. I understand that some of the other states are contemplating similar laws also.

We have been using a moving table. Only recently I had occasion to check up how much work can be done on that and I found it to be as much as eight thousand pounds in three hours. That is with a LaMotte blast.

F. G. JAEGER:—Did it have any effect in warping the casting?

W. C. LINDEMANN:—Yes. But if you take a piece it may warp on one side only.

A MEMBER:—We did not try the steel shot, but we have tried steel

grip. We have found that it must be dry or it will give trouble. Have you found the same tendency?

F. G. JAEGER:—When it is transported in wet weather it must be covered up to avoid getting wet.

W. C. LINDEMANN:—When we first went into sandblast enameling and for a year or two more we used hydrochloric acid, but sandblasting is far superior to the pickle. The discards on the pickle have dropped as much as 20 to 30%.

F. G. JAEGER:—We had some experience with another company, and we had the same trouble Mr. Lindemann described in the warping.

L. D. BRIDGE:—How much sand for a pound of casting is used? More specifically on a stove plate casting?

F. G. JAEGER:—That depends somewhat on the size of the castings. It would average about four thousand pounds of casting in eight hours, and we would use about one thousand to fifteen hundred pounds of sand. It also depends on the operator. If he is a good workman, you can get the average amount or better, and perhaps save on the sand.

B. T. SWEELY (Chairman):—Mr. Lindemann, is there a bill introduced in your state in regard to spraying?

W. C. LINDEMANN:—There was a bill before the legislature two years ago prohibiting spray guns. That would prohibit the use of spray guns in any work that might be objectionable to the health. It is again before the Legislature, and there is considerable propaganda out. The manufacturers are endeavoring to show that it is not injurious to the health. I understand that it is being brought up by the painters in the Chicago, Milwaukee and St. Paul workshops, who are strongly unionized, together with the American Federation of Labor.

CHAIRMAN:—It is started by the unions in a short-sighted policy in opposition to labor saving devices. The same bill is up before the California legislature.

E. HOGENSEN:—Some of this trouble is due to improper fans being used. Oftentimes the manufacturers themselves are to blame for not using larger fans.

B. T. SWEELY (Chairman):—Do you know how far this legislation has gone?

E. HOGENSEN:—Only in California and our neighboring states.

CHAIRMAN:—It would be of considerable interest to the Division to know. If this thing is going to be acute, we shall have a great deal of trouble on our hands. On most of the flat work, spraying has come to be almost the universal method of applying the enamel.

DISCUSSION ON "SUBSTITUTING OIL FOR PRODUCER GAS"[1]

W. W. Oakley:—Will you give us the cost of the oil per gallon; also whether they tried any sheet flame burners?

F. S. Thompson:—The price of the oil was $4^1/_2$ cents in the car on our siding. We did not use sheet flame burners. The plant under discussion is located in New England.

J. C. Hostetter (Chairman):—Oil is somewhat cheaper there due to the fact that it is brought in by boat; perhaps Texas or Mexican oil is used. The glass pull is 15 or 16 tons, is it not?

F. S. Thompson:—Yes, the tonnage pull is approximately 16 tons. The designed capacity is 20 tons.

A Member:—How about the pressure necessary on that burner in order to get flame? Is it necessary to use excessive pressure?

F. S. Thompson:—At the start we used air at 60 pounds, afterwards steam under 100 pounds at the boiler and 70 pounds at the burner.

Chairman:—This oil is cheaper than we get it in Corning.

G. Aurien:—What is the gravity of the oil?

F. S. Thompson:—18 to 20. The price of coal is $9.50. At that time it was about $8.00 delivered in New York.

Mr. Milford cited an instance where heavy Mexican crude oil was used to heat a recuperative furnace. The burners were located at the rear of the furnace and the charging took place at the side. The oil was fed to the burners under considerable pressure with the result that the flame extended about two-thirds of the distance of the melting chamber of the tank.

Whenever the tank was charged with new batch the dusty portion would be swept along by the flame and would be deposited in the recuperator passages with any condensed volatile products.

An examination was made of some of the fused material taken from the recuperator passages and it was found to contain large percentages of soda ash, lime and sulphur compounds. It also showed about 5% arsenic.

Mr. Milford stated that the oil worked satisfactorily in a recuperative furnace.

G. Aurien:—I came particularly to get information. We have all had some little experience in burning oil. The question arises in my mind as to whether or not a heavy gravity oil in a narrow furnace, say 16 feet in width, would be more expensive or less on account of combustion or non-combustion, compared to 30 gravity oil. It has been our experience that the heavy gravity oil takes longer to form complete combustion resulting in a waste. I would like to hear an expression of opinion from

[1] F. S. Thompson, *Jour. Amer. Ceram. Soc.*, **6** [10], 1050 (1923).

someone who has had the same kind of an experience, whether a lighter oil would be more beneficial than a heavy one in a narrow furnace.

CHAIRMAN:—We have a large number of combustion engineers with us.

J. F. Greene explained that at about the time the coal strike came along they had a furnace built with a recuperator and a high pressure oil system was installed whereby oil was atomized at one side, at the back of the furnace and the exhaust flue was on the other side, giving them a horseshoe flame.

On installing this system we were advised to use a Pennsylvania residuum oil of about 32° Baumé. The oil system company stated that the best results were obtained with this oil.

We were making a rather hard glass in this furnace and to keep the boots hot were obliged to force the fire well down into the nose. We found it impossible to get clean glass in the boots, even with this high grade light oil. Standard oil of the same gravity was no worse and no better than the pure Pennsylvania oil. The primary and recuperator air supplies were varied systematically in the attempt to find good working conditions. Flue gas analyses showed practically no CO with varying amounts of CO_2 and excess oxygen. But the deposition of carbon on the glass continued.

Later we made a softer glass in this tank with complete success. In this case we used more stack and were able to keep the fire away from the boots.

The dirtying of the glass was due, evidently, to a deposition of carbon during the passage of the flame through the furnace, and occurred in spite of sufficient air supply, good mixing, and a light clean fuel oil. The successful application of fuel oil to a glass melting furnace, especially for the manufacture of high grade ware, requires that the glass, the furnace, and the oil system be chosen so as to work well together. Each one of these three elements must be considered in its relations to the other two.

CHAIRMAN:—Was the oil pre-heated?

J. F. GREENE:—Yes, at the central pump house, and supplied to the burner at a little over 100°F.

DISCUSSION ON "PRODUCER GAS FOR BURNING REFRACTORIES"[1]

A. F. GREAVES-WALKER:—The refractories manufacturers at the present are much interested in the development of the railroad tunnel kiln for the burning of refractories. There seems to be a question in the minds of those interested as to the value of producer gas and one of the things that is worrying them is the question of firing at high temperatures. We can safely

[1] W. D. Richardson, *Jour. Amer. Ceram. Soc.*, **6** [7], 799 (1923).

profit by the experience of the European refractories manufacturers. The American Refractories Company is operating a kiln in Austria burning 50 tons of magnesite a day with brown coal producer gas. They are getting cone 20 continuously without any difficulty. Dr. Otto and Company of Dahleisen, Bendorf, Germany, are operating four kilns producing 40 thousand silica brick per day in each kiln and getting cone 14, using high volatile coal from the Lower Ruhr district. I think if there is any question about adaptability of producer gas, those examples should prove that there is no ground for it.

P. H. Dressler:—We have used producer gas to a large extent and can state that there is no trouble at all in reaching high temperatures, provided you have preheated air.

In regard to one of the points Mr. Richardson made concerning the use of steam in producers, I think, as a rule, it is found that where the gas is used very close to the producer there is every advantage in using the least volume of steam. Where the producer is quite a long way from the point of application of the gas and there is much cooling in the ducts, it is advantageous to use more steam and make a gas with a higher hydrogen content and a lower sensible heat. In this way more B.t.u.'s are delivered to the furnace. I believe it is considered by most of the producer gas experts that the sooting of the ducts is very largely due to the decomposition of the carbon monoxide into carbon dioxide and carbon which takes place at a low red heat. This is a reversal of the reaction which takes place at higher temperatures in the producer itself where carbon dioxide reacts with carbon to give carbon monoxide. There is, therefore, an advantage in making a fairly cool gas since this cuts down the sooting of the ducts. Where very hot gas is used, as for instance is common in the steel mills, the ducts clog up very rapidly.

Mr. Northey:—Mr. Richardson spoke of the compartment kiln as being more serviceable for burning the different sizes of material than the car tunnel kiln. In the compartment kiln, all compartments would burn practically the same. Just in which way will the compartment kiln accomplish this to better advantage than the tunnel kiln?

W. D. Richardson:—Each chamber of a compartment kiln is fired independently, so that more time can be taken with any compartment and the finishing temperature may be higher or lower in one compartment than in another. In a tunnel kiln to make such variations in time and temperature interferes more or less with its operation, and the best results are obtained when the cars are all set in the same manner, with the same size of ware, and the speed of the cars through the tunnel is uniform. Moreover, the cooling of the ware in a tunnel kiln is necessarily rapid for economical operation while large bodies should be cooled more slowly than small ones. So I have said that the compartment kiln has greater flexibility.

You can burn any kind of clay product in it and give any compartment such time and temperature as may be required without detriment to operations in other compartments.

D. W. Ross:—Can you readily burn in your compartment kiln one chamber at cone 1, 2 or 4 and the next chamber at cone 10?

W. D. Richardson:—Yes.

D. W. Ross:—Without any special loss of heat?

W. D. Richardson:—Yes.

C. E. Bales:—I would like to ask the opinion of Mr. Richardson of the use of producer gas in round, down-draft periodic kilns.

W. D. Richardson:—Producer gas is being burned successfully in periodic kilns, where only moderate temperatures are required. Just how high temperature can be practically attained, using air at atmospheric temperatures, I do not know, but certainly not high enough for refractories. It would be practical, in some cases, to preheat the air for combustion with the heat of cooling or burning kilns and attain somewhat higher temperatures but the results would not be satisfactory in the fire brick industry.

Referring once more to the point of comparison between the tunnel kiln and the compartment kiln for firing shapes, Mr. Richardson pointed out, and the point was well taken, that it was possible to a certain extent to separate the small and large shapes in a compartment kiln, thus preventing the loss of production due to the slow firing required for large shapes. Most of the large shapes I have seen in a brickyard are not capable of being piled up to any height in a compartment kiln. They can only be set in the upper courses. That being so, this argument somewhat loses its force. Furthermore, it appears to me that whether the small and large shapes are set separately in different compartments or together in the same compartment, it makes no difference to the production of the kiln since if one compartment takes longer to fire off than usual this prevents the next compartment from being finished, it not being possible to have two compartments on full fire simultaneously. In this respect the compartment kiln is in exactly the same position as the tunnel kiln where if you have to hold some material longer in the heat zone it naturally delays the operation.

D. W. Ross:—I do not know whether that applies particularly to the problem in hand. The refractories of the glass industry are about as irregular as any clay shapes there are. They will normally pile about three high, thus filling the ordinary rectangular kiln to near its crown. It appears probable that such shapes would pile conveniently in the filling of the compartments.

MEMORANDUM ON POWER SITUATION IN THE UNITED STATES IN MILLION HORSEPOWER

By S. S. Wyer

The diagram (Fig. 1) shows the power situation in the United States in million horsepower. The diagram at the left shows that the present de-

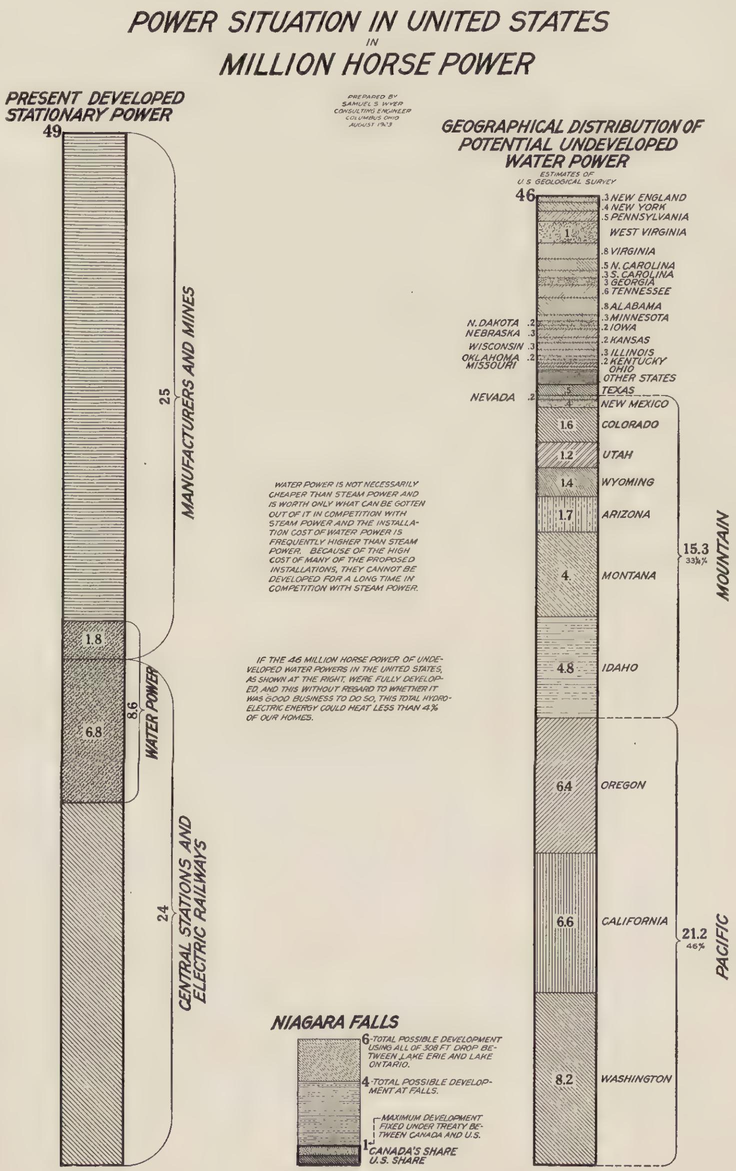


Fig. 1.

veloped stationary power is, in round numbers, 49 million. Of this total developed stationary power, 6.8 million water power is used in central stations and electric railways and 1.8 million water power is used in manufacturing plants and mines.

The diagram at the right, shows that there is 46 million horsepower of undeveloped water power in the United States and the vertical classification shows the geographical distribution. An interesting notation here is that 46% of the 46 million horsepower, or 21.2 million, is in the three Pacific Coast states, while 33%, or 15.3 million, is in the Rocky Mountain states.

If this entire 46 million horsepower of undeveloped water power in the United States were fully developed, and this without regard to whether it was good business to do so, the total hydro-electric energy could heat less than 4% of our homes.

The insignificance of Niagara Falls in relation to the total power situation is shown in the middle. If all of the flow of the Niagara River and the total head between Lakes Erie and Ontario were used, 6 million horsepower could be developed. If the head at the Falls alone was used, without using the drop in the whirl pool and rapids below, 4 million horsepower could be developed.

The treaty between the United States and Canada limits the total development to one million and out of this the United States' share is 400 thousand horsepower and Canada's 600 thousand horsepower.

ACTIVITIES OF THE SOCIETY

PRESIDENT'S PAGE

The entire SOCIETY is to be congratulated on the fact that during the past eleven months a larger number have joined the Society than during any previous twelve months. The number of withdrawals is less than last year. This bespeaks a heartening growth in appreciation of the value of this coöperative enterprise. To the Membership Committee is due especial praise for their effective plans laid for presentation of the opportunities of membership, but the solid worth of the SOCIETY in things accomplished is the basic reason for this substantial increase. While the increase in the SOCIETY's roster is evidence of essential work well done by the Membership Committee the greater reason for congratulation lies in the recognition they thus obtained for the real service being rendered.

It is my hope that the members will continue without abatement their presentation of the opportunities and benefits of membership in the SOCIETY. Only if this is done will the next budget committee feel justified in carrying on the present program, and it is impossible to think of failure after going so far.

* * *

The report of the Nominating Committee insures the SOCIETY of a strong and progressive board next year. Great things may be expected of them.

* * *

Georgia Tech is about to begin work on its new ceramic school. The legislature has appropriated $20,000, the ceramic interests of Georgia and the South $20,000, the Atlanta *Constitution* $8000, and the land on which the school is to be built has been donated. This is a splendid start for the new enterprise and speaks well for the clay-workers of Georgia, who have worked so hard to esatblish this, the first ceramic school below the Mason and Dixon Line.

* * *

The Committee on Papers and Program have outlined a splendid program for the Atlantic City meeting, but it will be necessary for every member to do his share to make it a success. The call for papers has gone out, and the officers hope for a generous response.

* * *

Application for a Section Charter has been made by the SOCIETY's members on the Pacific Coast. There is no doubt that this Section will fill a great need on the Coast, the members being so far removed from the center of the SOCIETY's activities in the East. The officers and members of the SOCIETY extend best wishes for success to the new Section.

NOMINATION FOR OFFICERS AND TRUSTEES FOR 1924

Persons placed in nomination by the nominating committee for officers and the nominees for Division representative on Board of Trustees are as follows:

President—Robert D. Landrum, Cleveland, Ohio.

Vice-President—Raymond M. Howe, Pittsburgh, Pa.

Treasurer—H. B. Henderson, Columbus, Ohio.

Trustees—

Art Division (1 year)—F. H. Rhead, Zanesville, Ohio

Enamel (1 year)—R. R. Danielson, Washington, D. C.

Refractories (1 year)—J. S. McDowell, Pittsburgh, Pa.
Glass (2 years)—J. C. Hostetter, Corning, N. Y.
White Wares (2 years)—C. C. Treischel, Pittsfield, Mass.
Heavy Clay (3 years)—C. Forrest Tefft, Watsontown, Pa.
Terra Cotta (3 years)—R. L. Clare, Woodbridge, N. J.

Article V, 2. "Any ten Active Members may constitute a self-appointed Nominating Committee and present names of nominees for President, Vice-President, and Treasurer to the Secretary for placement on the election ballot, provided such names are presented at least thirty days before the annual meeting."

In case of failure of election the Board of Trustees will at the time of the annual convention make appointments to fill the vacancies as provided for in Article IV, paragraph 12 of the Constitution.

All of the above-named nominees have accepted the nomination.

THE SOCIETY MAY BE GLORIFIED IN ITS GOOD WORK, BUT IT NEEDS OPPORTUNITY AND SUPPORT

Last June note was made of the fact that the membership had that month passed the 2000 mark. The 2200 mark was passed this month. Mention of this is only in passing for in fact it is only "in passing." The SOCIETY is on the way to obtaining that strength which the magnitude and character of the ceramic industries demand.

That the work which the SOCIETY is doing is being appreciated more and more is shown in the following data. These data, however, tell more than appreciation, they speak loud in terms of expectation. More members and greater facilities bring larger opportunities and greater obligations, and it is just these that the members of the SOCIETY are on their toes to meet to the full. Here is the record to date.

	Personal	Corporation	Total	Gain Personal	Gain Corp.	Gain Total
January, 1922	1350	139	1489			
January, 1923	1611	216	1827	261	77	338
November, 1923	1930	284	2214	319	68	387

The net gain in members during the month of October 15 to November 15 was 68 personals, 30 corporations. There is one more month remaining in 1923 to make the record of corporation additions exceed the 1922 record of 77 new members. Rather than 68, the total corporation additions for 1923 should be 200. This is possible if every member does his share, thus increasing the opportunities for more effective promotion of the Ceramic Arts and Sciences.

NEW MEMBERS RECEIVED FROM OCTOBER 15 TO NOVEMBER 15

PERSONAL

Robert Ahrens, 850 E. 5th St., St. Paul, Minn., Foreman of Porcelain Division, Seeger Refrigerator Company. (Reinstated.)

Robert J. Anderson, U. S. Bureau of Mines, Pittsburgh, Pa., Metallurgical Engineer.

Yngve R. Anderson, University of Saskatchewan, Saskatoon, Sask., Canada, Student Member.

Stanley Aronson, 5043 Franklin Ave., Los Angeles, Calif., Electric Furnace Dept., Research Lab., Vitrefax Co.

B. C. Berg, 5332 Santa Fe, Los Angeles, Calif., President Schurs, Oil Burner Company.

M. E. Blackburn, 18th and Union Sts., Bellaire, Ohio.

G. Ray Boggs, 612 Pacific Mutual Bldg., Los Angeles, Calif., Manager, American Clay Company and American Grinding Company.

Carl D. Bossert, 66 S. Third St., Columbus, Ohio, Civil Engineer.

Paul C. Boving, Pomona, Calif., Manager Pomona Tile Mfg. Company.

Wray G. Brady, 600 American Bank Bldg., Los Angeles, Calif., Secretary, Pacific Clay Products, Inc.

Oscar Brewer, 4901 Stenton Ave., Philadelphia, Pa., Sales Engineer, Leeds & Northrup Company.

Judson F. Clark, 285 W. Mountain St., Pasadena, Calif., President and Treasurer, Pomona Tile Mfg. Company.

Holt Condon, 189 S. Michigan Ave., Pasadena, Calif., Ceramic Engineer, Batchelder Wilson Company.

W. H. Cook, 608 Angeleno Ave., Burbank, Calif., Supt., Empire China Co.

W. S. Cook, Virginia Apartments, Parkersburg, W. Va., General Porcelain Company.

J. R. Crouch, c/o Pittsburgh Plate Glass Company, Charleroi, Pa., Assistant Superintendent.

Phillip H. Cruikshank, c/o H. Mueller Mfg. Company, Decatur, Ill.

E. M. Davids, Tropico Potteries, Glendale, Calif., Secretary.

J. L. Davis, 143 N. Daly St., Los Angeles, Calif., Superintendent, Pacific Clay Products, Inc.

Herbert R. Dickey, University of Saskatchewan, Saskatoon, Sask., Canada, Student Member.

Leon A. Dougherty, 1045 Fourth Ave., Astoria, N. Y., Ceramist, N. Y., Architectural & Terra Cotta Company.

Finlay M. Drummond, Jonathan Club, Los Angeles, Calif., Vice-President and General Manager, Alberhill Coal & Clay Company.

Robert W. Ellison, 112 N. Alta Vista, Monrovia, Calif., Chemist, The Vitrefax Co.

Stewart Findley, Los Angeles, Calif., Manager, Emsco Clay Co.

William J. Geddes, 611 Interstate Trust Bldg., Denver, Colo., Superintendent, Denver Sewer Pipe & Clay Company.

Karl Hart, 111 N. Rugby Ave., Huntington Park, Calif., Maintenance Supt., The Vitrefax Co.

Grant O. Herb, 2819 13th St., Washington, D. C., Junior Ceram. Engr., Bur. of Standards.

C. A. Hoppin, 607 Central National Bank Bldg., Peoria, Ill., President, C. A. Hoppin and Company.

F. T. Houlahan, 3700 9th Ave., S. Seattle, Wash., President, Brick and Tile Mfg. Company.

Henrietta O. Jones, St. Louis School of Fine Arts, Washington University, St. Louis, Mo.

Julius A. Kayser, 4943 Lansdowne Ave., St. Louis, Mo., Assistant Ceramist, Laclede-Christy Clay Products Corporation.

Henry Frank Lee, 2421 E. 55th St., Los Angeles, Calif., Ass't Supt. Production, The Vitrefax Co.

Wager Lewis, Cranberry Creek, N. Y., Superintendent, Gloversville Feldspar Company.

Daniel C. Lindsay, Bureau of Standards, Washington, D. C., Ceramic Division.

Robert Linton, 600 American Bank Bldg., Los Angeles, Calif., General Manager, Pacific Clay Products, Inc.

Cecil V. McClintock, Whittier, Calif., Route No. 2, Box 227, Pacific Clay Products, Inc., Plant 6.

Earl McClintock, 4556 N. Griffin Ave., Los Angeles, Calif.

William McClintock, 215 East Ave., 41, Los Angeles, Calif., Superintendent, Pacific Clay Products, Inc.

Al. J. Mesmer, Superintendent, St. Louis Fire Brick & Clay Company.

Frederick A. Moffat, Moffats Ltd., Weston, Ontario, Canada, General Manager and Treasurer.

Thomas A. O'Shaughnessy, 4705 N. Winchester Ave., Chicago, Ill., Color Dept., N. W. Terra Cotta Company.

Campbell Patch, Haws Refractories Company, Johnstown, Pa., Secretary and Treasurer.

Charles W. Peddrick, Jr., 170 Broadway, New York, N. Y., General Manager, Gloversville Feldspar Company.

W. H. Pelletier, 2226 Dennison Ave., Cleveland, Ohio, Chemist, Ferro Enameling Company.

Walter A. Preische, Alfred, N. Y. (Student Member).

Edward Reynolds, Santa Barbara, Calif., Manager, Unit Brick and Tile Company.

Robert Roadhouse, 49 Wooster St., Norwalk, Ohio, Enameler.

Rhoda L. Robbins, 229 Market St., Bloomsburg, Pa., Potter.

H. A. Rossell, Box 414, Bristol, Tenn., Mill Manager, Mineral Products Company.

Ichiro Shimada, Ebie Wishinarigun, Osaka, Japan, Glass Manufacturer.

J. F. Sinclair, c/o Jeffery-Dewitt Insulator Company, Kenova, W. Va., General Manager.

Krishen Singh, Katni Cement Factory, P. O., C. P. India.

James V. Slade, 38 S. Dearborn St., Chicago, Illinois, Chicago Manager, Dorr Co., Inc., Engrs.

Fred O. Slasor, 4419 S. Normandie Ave., Los Angeles, Calif., Superintendent, American Encaustic Tiling Company, West Coast Plant.

F. W. Spring, Metters, Ltd., Mitchell Road, Alexandria, Sidney, P. S. W., Australia, Enameler.

Walter G. de Steiguer, 1314 Bank St., S. Pasadena, Calif., Tropico Potteries, Inc., Superintendent, Tile Department.

Roger H. Stitt, 137 Hyland Ave., Ames, Iowa, Student.

G. C. Stoll, 211 Higgins Bldg., Los Angeles, Calif.

Justin C. Sturm, 76 E. Walton Place, Chicago, Ill., Inland Glass Company.

Arthur P. Taylor, 706 Burns St., Cincinnati, Ohio, Secretary and Treasurer, The Chas. Taylor Sons Company.

Clifford Tillotson, Route No. 2, Box 938, Los Angeles, Calif., Manager, Atlas Fire Brick Company.

Howard Webster, 702 Harrison Bldg., Philadelphia, Pa., Consulting Engineer.

Arch T. Weisgerber, Box 353, Alliance, Ohio, Production Manager, Crescent China Company.

Hugh E. Weightman, 608 S. Dearborn St., Chicago, Ill., Director, Research Division, Mophite Company.

A. H. C. Wenger, Messrs. Wenger, Ltd., Etruria, Stoke-on-Trent, England.

G. A. Wild, 605 Lankenlim Bldg., Los Angeles, Calif., President, Western Brick Company.

A. T. Wintersgill, 411 N. Louis St., Glendale, Calif., Salesman, Pacific Clay Products Co., Inc.

John Frederick Wynn, Beech Creek, Pa., Supt., General Refractories Company.

CORPORATIONS

American Lava Corporation, Electric Insulation, Chattanooga, Tenn. John Krusei, President.

The Atlas China Co., Mfgrs. of Semi-porcelain, Niles, Ohio. A. O. C. Ahundts, President and Treasurer.

Ball Brothers Co., Glass Mfgrs., Muncie, Ind., George A. Ball, Treas.

The Beach Enameling Co., Enameled Signs, Coshocton, Ohio.

Challenge Refrigerator Co., Grand Haven, Mich., E. O. Harbeck.

Columbian Enameling and Stamping Co., Mfrgs. of Enameled Ware, Terre Haute, Ind. Werner H. Grabbe.

Detroit Star Grinding Wheel Co., 111 Cavalry Ave., Detroit, Mich. Frank H. Whelden, Secy. & Treas.

The Dolomite Products Co., Producers of Dolomite Refractories, 1110 Euclid Ave., Cleveland, Ohio. H. P. Gells, Jr., Pres. and Gen. Mgr.

Findlay Clay Pot Co., Washington, Pa.

Florida China Clay Co., Producers of Florida China Clay, Box 83, Leesburg, Fla. L. A. Morris, Secy. & Treas.

Friderichsen Floor & Wall Tile Co., 215 E. Kansas St., Independence, Mo.

William J. Geddes, Denver Sewer Pipe & Clay Co., 611 Interstate Trust Bldg., Denver, Colo.

Gill Clay Pot Co., Mfgrs. Clay Pots and Tank Blocks, Muncie, Ind. Charles O. Grafton.

Jeffery-Dewitt Insulator Co., Kenova, W. Va. J. F. Sinclair, Gen. Mgr.

Kohler Co., Enameled Plumbing Fixtures, Kohler, Wis. Walter J. Kohler, Pres.

Lapp Insulator Co., Inc., Electrical Porcelain, Leroy, N. Y. G. W. Lapp.

Metropolitan Paving Brick Co., Mfgrs. paving brick, common brick and hollow tile, Canton, Ohio. R. B. Keplinger, Asst. Gen. Mgr.

Missouri Fire Brick Co., 418 Security Bldg., St. Louis, Mo.

Mitchell-Bissell Co., 334 Fourth Ave., New York City. John A. Williams, Asst. Secy.

New Jersey Pulverizing Co., 15 Park Row, New York City. Harry F. Spier, Pres.

New Jersey Terra Cotta Co., Mfgrs. of Terra Cotta, Singer Bldg., New York City. E. V. Eskesen, Pres.

The Northwestern Terra Cotta Co., Mfgrs. of Architectural Terra Cotta, 2525 Clybourne Ave., Chicago, Ill. A. F. Hottinger.

J. M. Seasholtz, Porcelain Enameling, Front and Spruce St., Reading, Pa.

The A. A. Simonds-Dayton Co., Grinding Wheel Mfgrs., N. Summit St. and Negley Place, Dayton, Ohio, Frank R. Henry, Secy.

Simplex Engineering Co., Washington Trust Bldg., Washington, Pa. C. E. Frazier, Pres.

United States Gauge Co., Sellersville, Pa. W. H. Lentz.

United Clay Mines Corp., Trenton, N. J. C. C. Engle, Gen. Sales Mgr.

The Vitrefax Co., Refractories, 51st & Pacific Blvd., Los Angeles, Calif.

Wishnick Tumpeer Chemical Co., Importers and Dealers in Chemicals, Oils, Colors, 365 E. Illinois St., Chicago, Ill. Michael Agazim.

Waltham Grinding Wheel Co., Waltham, Mass. M. F. Cunningham, Gen. Mgr.

Membership Workers' Record

Name	Personal	Corporation	Name	Personal	Corporation
Alice A. Ayars	1		John M. Dell		1
L. L. Beeker	1	1	Frederick W. Donahoe	1	
George Brian		1	B. K. Eskesen		1
E. N. Bunting	1		Geo. P. Fackt	1	1
Paul E. Cox	1		F. C. Flint		3
R. R. Danielson	2		H. C. Goodwin		1
H. E. Davis	1	2	Roland W. Gouin	1	

Name	Personal	Corporation	Name	Personal	Corporation
F. M. Hartford	1		A. R. Payne	1	
T. D. Hartshorn	1		F. H. Riddle		2
John Herzog	1		W. S. Roberts		1
L. C. Hewitt	1		John Sawyer	8	
Frank Humpel		1	Homer F. Staley	1	
E. C. Hunting	1		Gail R. Truman	2	
E. L. Hutchinson	1		Gus M. Tucker	1	
Herbert Goodwin	1		Karl Turk	1	1
R. M. King		1	W. E. S. Turner	1	
W. M. Jacobs	1		W. F. Wenning	1	
A. A. Klein	1		Otto W. Will	1	
H. J. Knollman	4		Hewitt Wilson	1	
Paul S. MacMichael	1		W. G. Worcester	2	
Werner Malsch	1		R. C. Zehm	1	
Ellsworth Ogden	1		A. S. Zopfi		1
Fred Ortman	8	1	Office	11	1
W. G. Owen	1			—	—
C. W. Parmelee	1			68	30

PERSONAL ACTIVITIES OF SOCIETY MEMBERS

Roy C. Brett has moved from 1697 Lee Road to 1545 Parkhill, Cleveland, Ohio.

John Campbell who has been employed with the Asbestos Wood Co., Nashua, New Hampshire has moved to Canada where he is located with the Abitibi Power and Paper Co., Iroquois Falls, Ontario.

F. F. Carhart is living at 727 Forty-first street, Des Moines, Ia., having moved from Sheffield, Iowa recently.

Sandford S. Cole, formerly instructor in the department of Ceramics, at the University of Illinois has moved to Pittsburgh, Pa., where he is located in the Koppers Laboratory, Mellon Institute.

Herman L. Cook is now located at Stevens Brothers and Co., Stevens Pottery, Ga. Mr. Cook formerly lived in Danville, Ill.

James A. Davies who has been filed among "members lost" lives at Parkwood Drive, Cleveland, Ohio.

J. A. De Celle has moved from Waukegan, Ill., to 131 N. Sheridan Road, Highland Park, Ill.

Redfield Dinwiddie recently of Somerville, N. J. has removed to 213 W. 21st street, New York City.

Bert De Witt formerly of the Belmont Stamping and Enameling Co., New Philadelphia, Ohio, is now with Genderp-Paeschke and Frey of Milwaukee, Wis.

W. Russell Greer gives 612 Hollen Road, Baltimore, Md., as his correct address.

F. P. Hall who has been with the Bureau of Standards, Washington, D. C., has moved to 884 Massachusetts Ave., Cambridge, Mass. Mr. Hall is taking graduate work in the department of Physical Chemistry, Massachusetts Institute of Technology.

Herman A. Hall, formerly of Medina, Ohio, is now with the Graham Clay Products Co., Conneaut, Ohio.

John H. Kennedy has moved from Canandaigua, N. Y., to 243 Pulteny St., Geneva, N. Y. Mr. Kennedy is employed with the Lisk Manufacturing Co., Ltd.

S. Spicer Kenyon has removed from 2214 15th street to 2490 Pierce Ave., Niagara Falls, N. Y.

Harry J. Knollman writes that his new address is 1210 W. 28th street, Los Angeles, Calif.

F. M. Koenig, manager of the Schoonhoven Pottery, Schoonhoven, Holland notified the Secretary's office that his address is Bergen street, Brooklyn, N. Y.

James W. Moncrieff of Stockton, Calif., is living at 1215 Pine street.

William E. Rice of Alliance, Ohio, is employed with the U. S. Bureau of Mines, 4800 Forbes street, Pittsburgh, Pa.

Fred Sauereisen of the Technical Products Co., has been transferred from East Liverpool, Ohio to the Pittsburgh Office, 116 South Sheridan Ave.

H. H. Stephenson, formerly of Montreal, Canada has accepted a position with the American Encaustic Tiling Co., Zanesville, Ohio.

Lawrence A. Vincent has moved from Zanesville, Ohio to New Castle, Pa.

R. T. Watkins is living at 1410 W. University Ave., Urbana, Ill. Mr. Watkins is an instructor in the Department of Ceramics, University of Illinois.

Glen D. Williams has moved from Waukegan, Illinois to Worcester, Mass.

William A. Yung has moved from Harrison, N. J. to Pittsburgh, Pa. where he is employed with the Macbeth-Evans Glass Co.

NEW ENGLAND SECTION FALL MEETING

By C. H. Lawson[1]

The Fall Meeting of the New England Section of the American Ceramic Society was held at the Boston City Club on Saturday Evening, October 27th at 7 o'clock P.M. with the following members present:

William Pettignew, The Norton Co., Worcester, Mass.
Albert S. Adcock, The Norton Co., Worcester, Mass.
C. A. Underwood, Queen's Run Refractories Co., Boston, Mass.
W. A. Robertson, Dedham Pottery, East Dedham, Mass.
Glenn D. Williams, The Norton Company, Worcester, Mass.
L. B. Bassett, Baxter D. Whitney & Sons, Inc., Winchendon, Mass.
A. C. Postley, The River Feldspar & Milling Co., Middletown, Conn.
J. M. Grafton, Boston Pottery Company, Boston, Mass.
S. H. Slobodken, Boston Pottery Company, Boston, Mass.
E. D. May, Baxter D. Whitney & Son, Inc., Winchendon, Mass.
Arthur T. Malm, The Norton Company, Worcester, Mass.
C. B. Tilton, Cortland Grinding Wheel Corp., Chester, Mass.
A. A. Klein, The Norton Company, Worcester, Mass.
M. F. Cunningham, Waltham Grinding Wheel Company, Waltham, Mass.
Geo. Henderson, Dorchester Pottery Works, Dorchester, Mass.
Harold E. Bigelow, New England Porcelain Co., Hudson, Mass.
J. Fred Stingel, New England Porcelain Co., Hudson, Mass.
Arthur E. Baggs, The Marblehead Potteries, Marblehead, Mass.
C. H. Lawson, Waltham Grinding Wheel Company, Waltham, Mass.
Ross C. Purdy, American Ceramic Society, Columbus, Ohio.

General Secretary, Ross. C. Purdy, gave an inspiring talk on "Recent Developments in the Ceramic Industries and the value of Coöperative Research."

This proved to be of considerable interest to all the members and brought forth many questions and discussions.

[1] Secy-Treas. New England Section.

The rest of the evening was devoted to informal discussions of general interest.

The next meeting is planned for January but the exact date has not as yet been decided upon.

ST. LOUIS SECTION MEETING

The members of the St. Louis local section held a meeting Thursday evening, November 1, 1923. Dinner was served at 6:30 o'clock following which papers and discussions were given. The program of papers included:

"Conveyor Sprayer for Enamels," by F. G. Jaeger.
"Geology of Some of Our Missouri Clays," by S. M. Richards.
"Denmark and a Little about Danish Clay Products," by Julius Keyser.

There was an excellent attendance and the usual enthusiasm which marks the meetings of the local sections was enjoyed.

NOTES AND NEWS

SHORT COURSE AT THE UNIVERSITY OF ILLINOIS

The University of Illinois announces a Short Course in Clay Working and Enameling to be given January 14 to 26, 1924.

The course is designed to meet the requirements of practical men. It will deal with the principles underlying the work of managers, superintendents, foremen, burners and others who may be concerned with the manufacture of ceramic products.

A common school education will suffice as preparation for the course. No fees are required, but a contribution of one dollar toward the expense of printing leaflets necessary in certain courses is to be made by each person upon registration.

The course of instruction will include lectures, laboratory work and informal discussions. Besides the members of the staff of the Department of Ceramic Engineering and members of the Engineering and other faculties of the University of Illinois, it is expected that R. M. Howe of The Kier Fire Brick Company, Pittsburgh, Pa., formerly of Mellon Institute, R. R. Danielson of the U. S. Bureau of Standards, and Professor A. S. Watts, Head of the Department of Ceramic Engineering of Ohio State University, will assist.

Programs may be had upon application to the Department of Ceramic Engineering, University of Illinois, Urbana, Illinois.

CERAMICS VOCATIONAL COURSE AT NEWELL HIGH SCHOOL

Under the provisions of the Act relating to the coöperative arrangement between the U. S. Government and the States for the provision of industrial training a short course has been established at the Newell, W. Va. High School under the direction of the Department of Industrial Training, at the University of West Virginia.

This course is intended to cover the principles underlying the manufacture of pottery, with as close application to shop conditions as possible. It will be continued for 17 weeks, the classes being held on two evenings each week and each period being one and

one-half hours. The instruction is being given by J. W. Hepplewhite, of the E. M. Knowles China Co., Newell, W. Va., and R. V. Miller, of the Knowles, Taylor and Knowles China Co., East Liverpool, Ohio. Both are graduates of Ohio State University. They are being assisted by A. V. Bleininger, of the Homer Laughlin China Co. Supervision of the course is being exercised by Professor Maclin, of the University of West Virginia, Morgentown, W. Va., and Prof. A. D. Osborne, Supt. of Schools, Grant District, Hancock County.

At the first meeting held, November 5th, some 30 persons enrolled but additional names are being received daily so that an enrollment of at least fifty is expected. No tuition fee is required for residents of West Virginia but a small charge will be made for those residing outside of the state to help defray that part of the cost which is paid by the Newell school district.

NEW ORGANIZATION OF POTTERY SUPERINTENDENTS AND FOREMEN

By A. V. Bleininger

On Friday, November 16th, a large number of men engaged in supervisory positions of the pottery industry gathered in the rooms of the Pottery Manufacturers Club, East Liverpool, Ohio, in response to a call by C. F. Goodwin. The object of the meeting was the discussion of the possible organization of the works superintendents and foremen into an association having for its object the exchange of experiences connected with the operation of the plants. The idea met with immediate approval and was discussed at some length by a number of persons. Herbert Goodwin was elected chairman of the organization and Charles F. Goodwin, secretary. It was decided to hold monthly meetings to be arranged by a program committee which is to be appointed prior to each session. It appeared to be the desire of the members to discuss first of all some of the rules governing the matter of discharge and the hiring of operatives as well as others having to do with the practical side of plant operation. These topics were considered at length but all action was postponed until the next meeting. It would seem that this new organization will fill a long felt want and should prove successful since it has the support of so many men active in the industry.

DEAN COOLEY RESIGNS

Resignation of Mortimer E. Cooley, dean of the College of Engineering and Architecture of the University of Michigan, as president of the American Engineering Council of the Federated American Engineering Societies was announced at the opening session of a two-day meeting of the Executive Board of the Council held in Rochester, N. Y., October 12.

Dean Cooley, in presenting his resignation to the Board, said that he retires on account of ill health. He also made it known that he has been granted leave of absence by the University of Michigan for the second half of the academic year of 1923–1924.

Dean Cooley, it will be recalled, was among the principal speakers on the opening program of the Pittsburgh Convention meeting in February, 1923.

B. A. FORD, SECRETARY NATIONAL LIME ASSOCIATION

Burton A. Ford has been named Secretary and General Manager of the National Lime Association. This action was taken at a regular meeting of the Board of Directors, held in Chicago on October 11, 1923.

For the past three months Mr. Ford has been Acting Secretary of the Association, having been appointed to this position at the Annual Convention held last June. He is a graduate of the University of Maryland, and until the summer of 1922 was with the Virginia-Carolina Chemical Company in the capacity of Division Manager, and was also Secretary-Treasurer of the Bryant Fertilizer Company. In the summer of 1922 he became Assistant to W. R. Phillips, who was then General Manager of the National Lime Association, so he is thereby well qualified to handle his present position.

MINUTES OF MEETING OF CONFERENCE ON SPECIFICATIONS FOR REFRACTORIES[1]

By R. F. Geller[2]

This was the third of a series of conferences for the purpose of preparing specifications for refractories used by the Departments of the Federal Government.

The meeting was called to order at 10:15 A.M.

The following members were present:

R. F. Geller, Vice-Chairman, Bureau of Standards.

W. L. Pendergast, Bureau of Standards.

F. J. Quirk, Treasury Department.

D. B. Downer, Navy Department.

F. M. McGeary, Navy Department.

W. A. E. Doying, Panama Canal.

W. F. Fulweiler, Chairman of Committee C-8 of the American Society for Testing Materials, 319 Arch Street, Philadelphia, Pa.

J. S. McDowell, Refractories Manufacturers Association, Harbison-Walker Refractories Co., Pittsburgh, Pa.

George A. Balz, Refractories Manufacturers Association, Seaboard Refractories Co., Perth Amboy, N. J.

L. C. Hewitt, Refractories Mfg. Association, Laclede-Christy.

M. C. Booze, Refractories Mfg. Assn., Mellon Institute, Pittsburgh, Pa.

R. M. Howe, Refractories Mfg. Assn., Kier Fire Brick Co., Pittsburgh, Pa.

F. A. Harvey, W. A. Hull and E. L. Lasier were unable to be present.

The morning session was devoted to a discussion of the Progess Report[3] of work, carried out in the Bureau of Standards on a representative number of commercial refractories, as suggested at the second conference of the series which was held on March 8, 1922.

The afternoon session was opened with a discussion lead by Mr. Fulweiler, in which a scheme for classifying refractories according to the intended service, was presented. A working basis for such a scheme has been developed by Committee C-8 of the American Society for Testing Materials and is published in a Report of Committee C-8, a reprint of which was furnished to each member. Following this discussion, the accompanying specifications for boiler setting refractories were developed and tentatively approved.

Tentative Specifications for Boiler Setting Refractories

1. Designation.—The material covered by these specifications is a brick of special or standard shape composed of heat resistant clay or clays and which has been burned to produce the desired strength and structure.

[1] The Bureau of Standards, Washington, D. C., Oct. 23, 1923.

[2] Vice-Chairman.

[3] R. F. Geller, "Progress Report," *Jour. Amer. Ceram. Soc.*, 6 [10], 1098 (1923).

2. Workmanship.—(1.) All brick of the nine inch series must be uniform and regular in shape. They shall not vary from specified dimensions more than $^1/_8''$ in width and thickness, and $^3/_{16}''$ in length. For special shape brick, no dimension shall vary more than 2.0% from the dimension specified, unless greater variation is allowed by contract, but in no case shall a variation of less than $^1/_8''$ be specified.

(2.) Brick shall be compact, of homogeneous structure, free from checks, cracks, voids or soft centers. They shall be free from such swells, warps, twists, or distortions as will prevent ready and accurate laying up with a maximum joint of $^1/_8''$. All corners shall be sufficiently solid and strong to prevent excessive crumbling or chipping when handled.

3. Classes.—The refractories covered by these specifications shall be divided into six classes, as follows: SH 75; H 75; H 57; M 1; H 25; and M 7.

4. Definitions. Class SH 75.—Refractories of this class are intended for use under the most severe conditions of boiler practice, such as in marine boilers used by the Navy and in plant installations designed to operate at an average rating of not less than 175. Material of this class should have high resistance to slagging, spalling and severe temperatures.

In the U. S. Navy service refractories of Class SH 75 are used in oil fired boilers operated at greater than a 500 per cent rating, and where severe vibrations and rapid changes in temperature occur. In this service the brick are secured by anchor bolts.

Class H 75.—Refractories of this class are intended for use under conditions such as are encountered in general boiler practice. For this class, resistance to slagging, spalling and high temperature is important.

Class H 57.—Refractories of this class are intended for use under conditions where resistance to spalling is not of great importance and where resistant to slagging and high temperature is important. In general boiler practice they may be used in the side walls but, if the refractories used are limited to one brand, material of Class H 75 is recommended.

Class M 1.—Refractories of this class are intended for use at moderate temperatures such as are encountered in hand-fired boilers operated at an average rating not exceeding 125. Resistance to spalling and slagging is important under these conditions of temperature.

Class H 25.—This class is intended primarily for refractories of siliceous nature and for service in which resistance to slagging and spalling is not of particular importance, but in which the refractory is expected to resist deformation under load at relatively high temperatures. In general boiler practice, such conditions are encountered in sprung arches.

Refractories of class H 25 are particularly adapted for service under conditions where reistance to deformation under load, with soaking heats at relatively high temperatures, is important but where there is no marked fluctuation of temperature below approximately 650°C.[1]

Class M 7.—This class is intended primarily for refractories of siliceous nature, for service at moderate temperatures, and under the conditions where resistance to spalling and slagging is not important, but where resistance to deformation under load is important.

Refractories of this class are particularly adapted for service under conditions where resistance to deformation under load, with soaking heats at moderate tempera-

[1] Refractories of Class H 75 which withstand the load test satisfactorily may be included in this class.

tures, is important, but where there is no marked fluctuation of temperature below approximately 650 °C.[1]

5. **Qualifications. Class SH 75.**—*a.* The softening point shall be not less than that of standard pyrometric cone number 32 (approximately 1670 °C).

b. The material shall withstand fifteen (15) quenchings without failure.

c. The absorption after reheating should be not less than 6% nor more than 12%, but the failure of the absorption to lie between the limits specified shall not be considered sufficient basis for rejection.

d. Refractories intended for use by the U. S. Navy and the U. S. Shipping Board shall pass the Simulative Service Test.

Class H 75.—*a.* The softening point shall be not less than that of standard pyrometric cone number 31 (approximately 1650 °C).

b. The material shall withstand twelve (12) quenchings without failure.

c. The absorption after reheating should be not less than 6% nor more than 12%, but the failure of the absorption to lie between the limits specified shall not be considered sufficient basis for rejection.

Class H 57.—*a.* The softening point shall be not less than that of standard pyrometric cone number 31 (approximately 1650 °C).

b. The material shall withstand five (5) quenchings without failure.

c. The absorption after reheating should be not less than 2% nor more than 12%, but the failure of the absorption to lie between the limits specified shall not be considered sufficient basis for rejection.

Class M.—*a.* The softening point shall not be less than that of standard pyrometric cone number 29 (approximately 1610 °C).

b. The refractory shall withstand two (2) quenchings without failure.

Class H 25.—*a.* Siliceous refractories shall contain 70% or more, total SiO_2.

b. The softening point shall be not less than that of standard pyrometric cone number 30 (approximately 1630 °C).

c. The material shall withstand eight (8) quenchings without failure.

d. The deformation under load shall not exceed three (3) per cent.

Class M 7.—*a.* Siliceous refractories shall contain 70%, or more, total SiO_2.

b. The softening point shall be not less than that of standard pyrometric cone number 28 (approximately 1590 °C).

c. The material shall withstand four (4) quenchings without failure.

d. The deformation under load shall not exceed four (4) per cent.

6. **Methods of Testing.**—*A.* The content of total silica shall be determined by analytical methods described under the A. S. T. M. standard method, Serial Designation C 18–21.[2]

B. The softening point shall be determined according to the A. S. T. M. Standard Method of Test for Softening Point, Serial Designation C 24–20.

C. The quenching test shall be conducted on brick which have been heated uniformly, under no load, at 1400 °C for five hours, and allowed to cool slowly to room temperature.

The quenching is conducted in the following manner: the brick is heated by placing in the door of a suitable furnace which is being held at a temperature of

[1] Refractories of Class M 1 which withstand the load test satisfactorily may be included in this class.

[2] As an alternative method the uncombined silica may be determined by petrographic analysis, in which case it shall be not less than 35% for Class H 25 and Class M 7 refractories.

850 °C. The heated end of the brick should be flush with the inner face of the furnace and the outer end should be exposed to the free circulation of air.

At hourly intervals the hot end of the brick is immersed in running water for three (3) minutes and to a depth of four inches. The brick is then removed, allowed to steam in the air for five minutes, and returned to the furnace door. This cycle is repeated until the specimen has failed.

The brick is considered to have failed when the heated end has completely spalled away, or when the structure of the brick has become so weakened that it can be easily removed with the hand.

The results on any one brand shall be reported as the average of five specimens.

D. The absorption shall be determined for brick which have been heated uniformly, under no load, at 1400 °C for five hours, and allowed to cool slowly to room temperature.

The test shall be conducted on specimens not less than one hundred (100) grams in weight, one specimen to be taken from each of five brick of any one brand, and the average result reported.

The per cent absorption shall be determined according to the following formula:

$$\text{Per cent absorption} = \frac{W-D}{D}.100$$

W = weight of specimen after having been boiled in water for two hours and allowed to cool with the water.

D = weight of specimen after having been dried to constant weight at 110 °C.

E. The load test shall be conducted according to the A. S. T. M. Standard Method of Test for Heavy Duty Fire Clay Refractory Material under Load at High Temperatures, Serial Designation C 16–20.

F. The simulative service tests shall be conducted in the following manner:

1. Tests are conducted in small oil-fired furnaces, the dimensions and method of construction of which are shown on attached blueprint. For comparative purposes, one side wall of the combustion chamber is built up of brick and cement of approved brands and the other side wall of brick and cement of the samples under examination. Both walls are backed uniformly with three inches of insulation. An air atomizing fuel oil burner is used. The flame sweeps the length of the furnace, curves upward and returns to the front, then up the stack from which it escapes horizontally towards the rear of the furnace.

2. The test consists of two runs, each of 24 hours duration, at furnace temperatures of 1600 and 1670 °C respectively.

3. During each run the following temperature determinations are made:

Furnace temperatures.

Temperatures of outer face of brickwork of each side wall at front and rear of furnace.

4. Furnace temperatures are determined at quarter-hourly intervals with a Leeds and Northrup Optical Pyrometer sighting on flame through front of furnace above burner.

5. Temperatures of the outer face of the brickwork of each side wall are determined at half-hourly intervals, with a Leeds and Northrup Optical Pyrometer sighting on the brickwork through sillimanite tubes, the ends of which are placed flush with the wall. The tubes are carefully lagged and plugged to prevent radiation losses.

6. A spalling test is conducted at the conclusion of each run by injecting cold air at high velocity into the furnace immediately after shutting off the oil supply to the burner. The injection continues until the walls are cool.

7. The comparative heat-insulating properties together with the relative conditions of the side walls determine whether or not the material under test is acceptable for use in the Naval service.

7. Acceptance.—For refractories other than those intended for use by the U. S. Navy and the U. S. Shipping Board, the combined results of workmanship, chemical or petrographic analysis, fusion point, quenching, and load test where required, shall be considered as a suitability test.

For refractories intended for use by the U. S. Navy and the U. S. Shipping Board, the suitability test shall include the simulative service tests, but at the discretion of the purchasing officer the simulative service test may replace all other tests included in the suitability test.

Workmanship and softening point determination shall be considered as a control test.

8. Retesting.—Notice of the rejection of a shipment based on these specifications must be in the hands of the consignor, unless otherwise specified, within ten days after the receipt of the shipment at the point of destination. If the consignor desires a retest, he shall notify the consignee within five (5) days of receipt of said notice.

Following the formulation of the above specifications, which were based on the results of the laboratory work carried out by the Bureau of Standards and the observations and tests conducted by the various members of the conference, the service tests submitted by Stone and Webster were taken under consideration. These were found to cover so many phases of the problem, and the data was of such detailed nature, as to require considerable study and correlation. It was, therefore, decided to give these further consideration and to report the results of this study at a later date.

The conference adjourned at 5:15 P.M.

REPORT OF CONFERENCE ON HEAT TRANSFER THROUGH WALL STRUCTURES[1]

The conference convened at 11:00 A.M. Oct. 22, 1923, Dr. H. C. Dickinson presiding.

The following persons were present:

Virgil A. Marani, The Gypsum Industries, 844 Rush Street, Chicago, Ill.

C. H. Parkin, The Vortez Manufacturing Co., Cleveland, Ohio.

Wm. Carver, The Common Brick Mfrs. Association, 2121 Discount Building, Cleveland, Ohio.

R. P. Brown, The National Lime Association, 918 G Street, Washington, D. C.

Henry E. Stringer, Hydraulic Press Brick Company, Colorado Building, Washington, D. C.

F. J. Huse, Hollow Building Tile Mfrs. Association, 111 West Washington Street, Chicago, Ill.

Dudley F. Holtman, National Lumber Mfrs. Assoc., International Bldg., Washington, D. C.

Warren E. Emley, Bureau of Standards, Washington, D. C.

E. F. Mueller, Bureau of Standards, Washington, D. C.

M. S. Van Dusen, Bureau of Standards, Washington, D. C.

H. C. Dickinson, Bureau of Standards, Washington, D. C.

The conference consisted chiefly in a general discussion of the subject of heat transfer as applied to building walls, the following being a brief report of the principal points brought out in the discussion.

[1] Held at the Bureau of Standards, Washington, D. C.

About two years ago a similar conference was held at the Bureau, several of the men listed above being present. It was the unanimous opinion at that time that an investigation of the heat transfer through, and the moisture condensation on, building walls was very desirable and should be undertaken preferably by the Bureau of Standards. Ways and means were discussed, particularly with reference to financial support, and it was the opinion that the matter should be brought to the attention of Congress, but no formal action was taken.

About a year after this, a small allotment was made to the heat division of the Bureau to begin work on the heat transfer through walls. At the present time this investigation is producing definite results on the heat transfer through wall panels 6 ft. high by 3 ft. wide, under dry conditions and with negligible wind pressure on the two sides. The temperatures on each side of the panels can be varied anywhere within the range 0°F to 120°F. The method gives the relative contribution of each of the components of the wall, as well as the outside and inside surfaces, to the total resistance to heat flow. About ten panels have been built, representing some typical walls used in the construction of small buildings. They include the following:

Brick—9″—plastered inside directly on the brick.

Brick—9″—furred and plastered on inside.

Hollow tile—9″—plaster inside, stucco outside, air spaces horizontal. Two types of tile.

Hollow tile—9″—same with air spaces vertical.

Frame wall—2 x 4 studding: sheathing, building paper, metal lath and stucco on outside: wood lath and plaster on inside.

Concrete—8″—hollow blocks. Two kinds of concrete mix, one cinder.

Brick—9″—Ideal construction containing air spaces.

The panels are not special but represent as far as possible ordinary building construction.

The present conference was called to stimulate interest in this work, with the idea of giving it financial or other support in some way, so that it will be possible to make the investigation more complete in a shorter time, and also to investigate the possible effects of the infiltration of air and the condensation of moisture.

It was suggested that this work be done in coöperation with that of the Research Bureau of the American Society of Heating and Ventilating Engineers at Pittsburgh. The exact status of their work on heat transfer was unknown to the conference. The point was brought out that although a certain amount of coöperation was desirable, yet the confidence in the results would be much greater if similar results were obtained by more or less independent means.

The question of the relative heat losses through windows, doors, walls, and ceilings was brought up and it was agreed that this was a question for which an answer was required.

The question of laboratory tests versus tests under actual service conditions was discussed at length. It was argued that tests on actual buildings exposed to the weather were required in order to get results which could be applied to practical conditions. On the other hand it was pointed out that the comparison of various constructions under such variable conditions was in all probability subject to greater uncertainty than the application of laboratory data to service conditions. In laboratory tests the conditions can be varied at will and the effect of different components of the wall determined separately, with the result that much less time is consumed in covering the entire field. Tests can be made under various wind conditions without the variability imposed by the weather outside, and the effect of the wind observed with greater certainty than could be obtained under variable conditions. It was, however, considered desirable to check the laboratory tests on a few typical walls under actual service conditions. The sug-

gestion was made that a long structure could be built containing a number of rooms, each having a different exposed wall construction. By maintaining all the rooms at the same temperature by measured heat supply, the heat transmission of the various exposed walls could be compared under the same outside weather conditions.

It was moved and carried that the participants in the conference report to the respective associations they represent the necessity for carrying on the work on heat transfer through various types of exterior walls, recommend such financial support as is necessary, take up the matter with Secretary Hoover for the purpose of obtaining his consent and support, request manufacturers to write stating what types of walls they want tested, and ask the Bureau of Standards to formulate a program.

In the discussion of this motion it was estimated that $10,000 per year would cover the cost. In case any part of this was furnished by the industries, the question of a fair apportionment would have to be decided later on the basis of the importance of the subject to the individual industry. It was also pointed out that the estimates of the Bureau for the next fiscal year (beginning July 1, 1924) include allotments for this work and that any influence brought to bear on the budget committee by the industries would go a long way toward retaining the increases asked for. As another possibility in assisting the work it was suggested that the industries might detail men to the Bureau for certain lengths of time, as research associates. In this way the men get the benefit of training at the Bureau and both the industries and the Bureau profit by the arrangement.

The motion was made and carried that the industries be requested to furnish free of charge such materials as are necessary for the conduct of the tests to be laid out by the Bureau of Standards.

The motion was made and carried that the report of the meeting be sent to all parties listed below, and that they be requested to endorse the program.

American Society of Heating and Ventilating Engineers,
American Society of Refrigerating Engineers,
American Society of Civil Engineers,
American Society of Mechanical Engineers,
American Institute of Architects,
American Concrete Institute,
American Ceramic Society,
American Face Brick Association,
Associated Metal Lath Manufacturers,
Bureau of Standards,
Common Brick Manufacturers Association of America,
Concrete Products Association,
Engineering Council,
Forest Products Laboratories,
Gypsum Industry,
Hollowing Building Tile Mfrs. Association,
National Lime Association,
National Lumber Mfrs. Association,
National Association of Building Owners & Mfrs.,
National Housing Association,
Portland Cement Association.

The motion was made and carried that the American Society of Heating and Ventilating Engineers and the American Institute of Architects be invited to join the committee.

The motion was made and carried that Mr. Marani be appointed to interview Mr. Hoover in regard to the proposed program.

The motion was made and carried that the committee be considered as an advisory committee to the Bureau of Standards, governing the work outlined, and that Mr. Holtman be appointed chairman.

NOTES FROM THE U. S. BUREAU OF MINES

Investigation of Mineral Fillers

The investigation of the availability of certain minerals for use as fillers, together with a study of their physical and chemical characteristics, and their adaptability to commercial uses, is being continued by the Department of the Interior, through the Bureau of Mines. The South has extensive deposits of clays, ochres, bauxite, talc, graphite, etc., and the purpose of this study is to determine their value for use as fillers in making linoleum, paper and other commercial products.

The laboratory study of the size and character of grains of non-metallic mineral fillers has been completed. The results show that these characteristics have an important bearing on the applicability of a mineral filler and the types of manufactured products in which it can be used.

Laboratory work on Georgia and Alabama white clays to determine their value for filler use has been completed. The samples investigated included 31 Georgia and 11 Alabama clays. Of the Georgia clays, 17 were selected for more extended semi-commercial tests, and 500-pound samples were sent to the Ceramic Experiment Station of the Bureau of Mines at Columbus, Ohio, for washing, pulverizing and dispatching to the manufacturers who are coöperating in the factory tests. The laboratory tests have shown that a number of the Georgia clays tested are equal or superior in quality to the imported foreign clays now largely used in the paper trade. The bureau's tests also indicate the clays are of value in rubber filling, and rubber manufacturers are being furnished with samples of the Georgia clays, to test their value in rubber compounding.

Electrical Conductivity of Refractory Materials at High Temperatures

Reliable and comparable data are needed on the electrical resistivity at high temperatures of the refractory materials suitable for furnace linings. In the performance of experimental work by the Department of the Interior, at the Bureau of Mines Ceramic Experiment Station, Columbus, Ohio, methods and apparatus for making such measurements have been developed. Test pieces for determination of the electrical resistance were prepared from fire clay, kaolin, alundum, diaspore, thoria, silica, zirconia, magnesite, silicon carbide, sillimanite, zirkite, and magnesium spinel. Resistance measurements have been run on half of the pieces. Carbon electrodes are employed, measurements being run in an atmosphere of pure nitrogen to a temperature of 1400°C in a gas-tight platinum-resistance furnace.

Dolomite for Refractories

Research work on the utilization of dolomite in refractories is being continued by the Department of the Interior at the Ceramic Experiment station of the Bureau of Mines, Columbus, Ohio. The main problem being studied is to combine the lime in the dolomite so that it will be nonslaking and at the same time hold up the refractories, thereby rendering available abundant deposits of dolomite for extensive use as a basic refractory. Work previously done by the Bureau of Mines on different fluxes for

rendering dolomite refractories nonslaking indicated that by careful selection and preparation, refractory bricks could be made, one of the best fluxes tried being alumina-iron flux. More recent work done by the bureau consisted of slaking time tests on varying proportions of dolomite mixed with an alumina-iron flux. The proportion of flux to dolomite was varied between 5 and 20 per cent. The refractory properties as well as the slaking tendency of these mixes were studied. After the best proportion of flux to ground rock was determined, bricks were made by the soft mud and dry press processes, using both organic and inorganic binders. Then methods of firing to produce sound bricks were studied. As a result, a composition has been found which, when compounded with the proper binder and burned after a given procedure, produces a strong, nonslaking brick of high refractoriness. The bricks are satisfactory in every respect, except that uniform shrinkage has not been completely attained. During the coming year, bricks will be produced and tried out in the industry.

Preparation of Super-Refractories

Experimental work in the development of refractories from artificial sillimanite designed to be superior to the natural refractories now in use is in process at the Northwest Experiment Station of the Bureau of Mines, Department of the Interior, at Seattle, Wash. The work is being done in coöperation with ceramic trade interests. Sillimanite is the normal silicate of alumina, containing 63 per cent Al_2O_3 and 37 per cent SiO_2, and is also made artificially in the electric furnace. The best compound found is one a little richer in alumina than the pure sillimanite. One of the principal problems is the presence of impurities in the local clays that affect the fusing point. It was found that iron oxide present as impurity could be partly removed by reduction, but magnesia and lime could not be removed.

Effect of Carbon Monoxide on Refractories

Large-scale experiments with an electrothermic dry distillation process for the treatment of zinc ores, recently undertaken by the Mississippi Valley Experiment Station of the Bureau of Mines, Department of the Interior, were hampered by the rapid disintegration of condenser linings made of ordinary fire brick. A study of the problem developed that the action of carbon monoxide was largely responsible for the disintegration, due to the increase in volume caused by carbon deposition around particles of iron oxide contained in the refractory material. Thus the trouble can be avoided by the use of iron-free refractory material. Silica brick or high-grade fire brick free from iron were found to be satisfactory. Results of these experiments have widespread application as refractory brick must withstand the action of carbon monoxide gas when used in coke ovens, in iron-blast furnaces, in producer gas flues, and in the checker work of regenerative furnaces fired with producer gas.

Refractories for Steel Making

A survey of operating conditions obtaining in open hearth steel practice will be made by the Department of the Interior, at the ceramic experiment station of the Bureau of Mines, Columbus, Ohio, for the purpose of determining wherein available commercial refractories fall short of giving ideal service. The Bureau of Mines plans later, in coöperation with the steel industry, to undertake the development of ideal refractories for specific services.

SIZES AND WEIGHTS OF HOLLOW BUILDING TILE SIMPLIFIED

As a result of a general conference of manufacturers, distributors, and users of hollow building tile held at the Department of Commerce on October 19, 1923, under the auspices of the Division of Simplified Practice, it was unanimously agreed and adopted that definite weights and sizes of that commodity be considered as the standard of practice for the industry for one year effective January 1, 1924.

A survey of variety in sizes, dimensions, and weights reported at the preliminary conference of manufacturers held at the Department on June 19, 1923, showed 36 different sizes, each made in a wide variety of weights. A compilation and review of the figures brought out by this survey was made by the Standards Committee of the Hollow Building Tile Association and was used as a basis for adoption at the general conference.

Mr. Hudson of the Division of Simplified Practice opened the conference as presiding Chairman and gave a brief outline of the accomplishments of other industries in

Standard Load Bearing Wall Tile		
End Construction		Weight
3 3/4 x 12 x 12	3 cells	20 lbs.
6 x 12 x 12	6 cells	30 lbs.
8 x 12 x 12	6 cells	36 lbs.
10 x 12 x 12	6 cells	42 lbs.
12 x 12 x 12	6 cells	48 lbs.
Side Construction		
3 3/4 x 5 x 12	1 cell	9 lbs.
8 x 5 x 12	2 cells	16 lbs.
8 x 5 x 12 ("L" shaped)		16 lbs.
8 x 6 1/4 x 12 ("T" shaped)	4 cells	16 lbs.
8 x 7 3/4 x 12 (square)	6 cells	24 lbs.
8 x 10 1/4 x 12 ("H" shaped)	7 cells	32 lbs.
Standard Partition Tile		
3 x 12 x 12	3 cells	15 lbs.
4 x 12 x 12	3 cells	16 lbs.
6 x 12 x 12	3 cells	22 lbs.
8 x 12 x 12	4 cells	30 lbs.
10 x 12 x 12	4 cells	36 lbs.
12 x 12 x 12	4 cells	40 lbs.
Standard Split Furring Tile		
2 x 12 x 12		9 lbs.
Standard Book Tile		
3 x 12 x 18 to 24		18 lbs. per sq. ft.

the building material field who have effected economies through the application of Simplified Practice to their commodities.

The conference decided to vote on the list submitted by sections and the discussion opened on the 12 x 12 x 12 standard load-bearing wall tile for end construction. It was contended that this size did not permit of combined brick and tile construction for the city of Washington. It was brought out by the tile manufacturers that this size

would adequately meet the requirements of any construction and that its failure to do so in Washington was due to the fact that builders in that vicinity were not using the standard size brick as adopted at the Brick Conference held at the Department of Commerce on June 21, 1923.

Mr. Sturtevant of the Association explained to the conference that the last four units of tile as listed under standard partition tile were under a course of tests at the Bureau of Standards and their findings would determine whether they would be classed as floor tile of standard weights. The remaining groups were voted on and unanimously adopted.

After considerable debate as to tolerance for weights and dimensions, it was unanimously passed that not more than 5 per cent tolerance over or under would be allowable for weights and 3 per cent over or under for dimensions covering length, width, and height.

January 1, 1924, was set as the date the recommendation should become effective and to remain in force for a period of one year from that date.

A standing committee of the conference consisting of three representatives of manufacturers, three of distributors, and three of consumers was decided upon as a means of providing a follow-up to insure the adoption of the simplifications embodied in the recommendation of the conference; to effect a greater degree of contact and coöperation between the Department and the industry; and to consider further eliminations or substitutions in the existing varieties of tile. The personnel of this committee will be announced later.

The accompanying list gives in detail the weights, sizes, and types of tile adopted at the conference.

Personnel in Attendance

Bevier, P. H., Hollow Building Tile Association, Flatiron Bldg., New York City.
Brady, Wm. G., 439 Treasury Building, Washington, D. C.
Cartwright, Frank C., Division of Building & Housing, Department of Commerce.
Dailey, E. W., North Iowa Brick & Tile Co., Mason City, Iowa.
Deckman, Chas. G., Medal Paving Brick Co., Cleveland, Ohio.
Dixon, C. W., Columbus Brick & Tile Co., Columbus, Ga.
Downer, H. C., The Malvern Fire Clay Co., Malvern, Ohio.
Ginder, J. W., Federal Specification Board, Treasury Department, Washington, D. C.
Graham, Bert J., Denison Interlocking Tile Corpn., Guardian Bldg., Cleveland, O.
Green, A. L., American Railway Association, Chicago, Ill.
Healy, John P., Building Officials Conference, 108 Municipal Bldg., Washington, D. C.
Holden, P. E., Asst. Mgr., Fabricated Production Department, United States Chamber of Commerce, Washington, D. C.
Hutton, Jr., Wm. Troy Fireproofing Co., Troy, N. Y.
Ingberg, S. H., American Society for Testing Materials, and National Bureau of Standards.
Juse, Frank J., Chief Engineer, Hollow Building Tile Assn., Chicago, Ill.
Keasbey, H. M., National Fire Proofing Co., Fulton Bldg, Pittsburgh, Pa.
Peace, T. M., Alfred, New York.
Rommel, Edward, Consolidated Clay Products Co., Canton, Ohio.
Sleeper, J. S., Secretary, Hollow Building Tile Assn., Chicago, Ill.
Snow, W. A., American Clay Products Co., 175 Fifth Ave., N. Y. City.
Straight, H. R. Hollow Building Tile Assn., Adel, Iowa.
Sturtevant, E. R., Hollow Building Tile Assn., Dallas, Texas.
Thomas, H. B., National Fire Proofing Co., 949 Broadway, New York City.

Wallace, R. G., Hollow Bldg. Tile Assn., Fulton Bldg., Pittsburgh, Pa.
Whitacre, J. B., Whitacre-Greer Fireproofing Co., Waynesburg, Ohio.
Wilson, Wm. E., Mason City Brick & Tile Co., Mason City, Iowa.
Wright, Francis, H., Hay-Walker Brick Co., 52 Vanderbilt Ave., Pittsburgh, Pa.
Yepsen, V. L., Anness and Potter Fire Clay Co., Woodridge, N. J.

Division of Simplified Practice, Department of Commerce
Hudson, R. M.
Colwell, H. R.

CALENDAR OF CONVENTIONS[1]

Organization	Date	Place
AMERICAN CERAMIC SOCIETY (Annual Meeting)	Feb. 4–8, 1923	Atlantic City
American Concrete Institute	Feb. 25–28, 1924	Chicago
American Face Brick Assn.	Dec. 4–6, 1923	French Lick Springs, Ind.
American Institute of Electrical Engineers	Feb. 4–7, 1924	Philadelphia
American Malleable Castings Assn.	Jan., 1924	Cleveland, Ohio(?)
American Road Builder's Assn.	Jan. 14–18, 1924	Chicago
American Zinc Institute	May, 1924	St. Louis, Mo.
Assn. of Scientific Apparatus Makers of U. S. A.	April 18, 1924	Washington, D. C.
Common Brick Mfrs. Assn. of America	Feb. 11, 1924	Los Angeles, Calif.
Gas Products Assn.	Jan., 1924	Chicago
Hollow Bldg. Tile Assn.	Jan., 1924	Chicago(?)
Institute of Metals, Div. of American Institute of Mining and Metallurgical Engineers	Feb., 1924	New York City
Natl. Assn. Brass Mfrs.	Dec., 1923	New York City
Natl. Assn. of Stove Mfrs.	May 7–8, 1924	New York, Hotel Astor
Natl. Bottle Mfrs. Assn.	April 27, 1924	Atlantic City
Natl. Brick Mfrs. Assn.	Jan. 28–Feb. 2, 1924	Cincinnati, Ohio
Natl. Builders Supply Assn., Inc.	Feb., 1924	Chicago(?)
Natl. Electric Light Assn.	May or June, 1924	
Natl. Glass Distributors Assn.	Dec. 4–5, 1923	Pittsburgh, Pa.
Natl. Paving Brick Mfrs. Assn.	Dec., 1923	
Natl. Exposition of Power and Mechanical Engineering	Dec. 3–8, 1923	New York City
Penna. Gas Assn.	April, 1924	Atlantic City
Society of Promotion Engineering Education	July, 1924	Boulder, Colo.
Stoker Mfrs. Assn.	April or May, 1924	(?)
U. S. Potters Assn.	Dec., 1923	Washington, D. C.
Western Society of Engineers	June 4, 1924	Chicago

[1] Further information may be secured through the Chamber of Commerce of U. S., Washington, and World's Convention Dates, New York, N. Y.

AUTHOR INDEX TO BULLETIN

The reference number in parenthesis refers to the *monthly* number of the *Bulletin;* the number following this is the *page* number. The letter D preceding reference number indicates that the article is a Discussion (D); the letter O means that article is original (O).

VOLUME 2

SUBJECT INDEX TO BULLETIN

2-1/5

[illegible]